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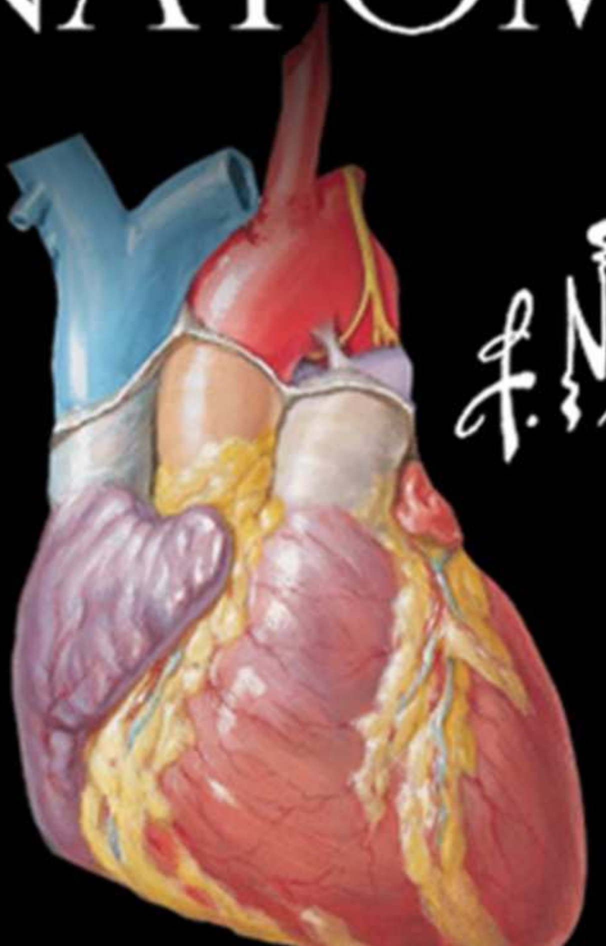
ATLAS OF HUMAN ANATOMY



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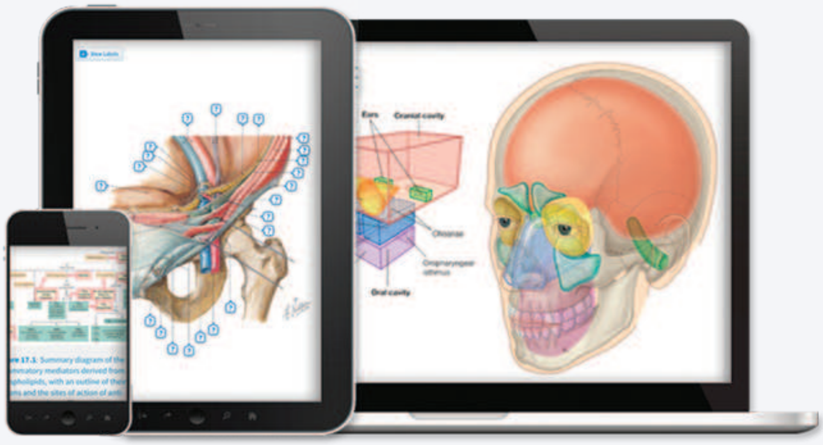

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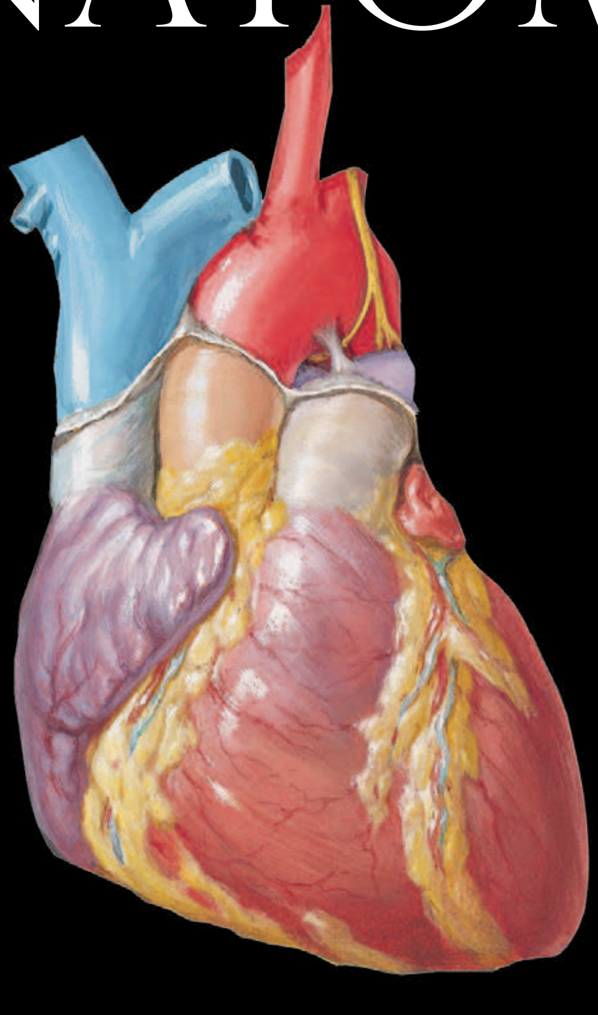

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NEW TO THIS EDITION

With your copy of the Frank H. Netter, MD, *Atlas of Human Anatomy*, you own a collection of some of the most well-known depictions of human anatomy in medicine and healthcare. In addition to the famous work of Dr. Netter, with your copy of this 7th edition, you also have access to nearly 100 painted pieces by Carlos A. G. Machado, MD, one of the foremost medical illustrators working today. Dr. Machado's contributions to the *Atlas* highlight important views of anatomy that have become more clinically relevant in recent years— anatomic views that have resulted from improved dissection techniques and modern imaging. In addition, you have access to more than 50 carefully selected radiologic images that help bridge the idealized illustrated anatomy with living anatomy viewed in the clinic.

While numerous updates have been made to the illustrated plates and tables to make them easier to learn from, the most significant changes to this edition include:

Introductory Section

To fulfill the requests from many students and fans of Netter's *Atlas*, we have added a new opening section containing several overview plates. These plates provide the very first head-to-toe views in the *Atlas of Human Anatomy!*

Clinical Tables

The *Atlas of Human Anatomy* is the only anatomy atlas illustrated by physicians. Dr. Netter was a surgeon and Dr. Machado is a cardiologist. The views of anatomy in this atlas have always reflected a clinical perspective. In line with this clinical focus, and in congruence with integrated curricula in health and medicine, tables at the end of each regional section highlight the most commonly injured structures, as well as other structures with high clinical significance and commonly covered in anatomy courses. The tables provide students with quick summaries, organized by body system, and note where to best view these key structures in the illustrated plates.

New Art Plates by Dr. Machado

For this edition alone, over 25 new illustrations have been painted by Dr. Machado. Suggestions for new plates of additional anatomic views and concepts are submitted by students, faculty, anatomists, physicians, and others. Sometimes suggestions are solicited at major anatomy conferences with a "What Should Carlos Paint Next?" idea box. Decisions around which new plates are prioritized and given space in a new edition come from discussions among consulting editors. The new plates for this edition are largely those that portray structures with clinical significance (Fascial Columns of the Neck, Deep Veins of the Leg, Hip Bursae, and Vasculature of the Prostate) or those that are difficult to visualize (Infratemporal Fossa)—and, of course, the new additions created for the introductory section.

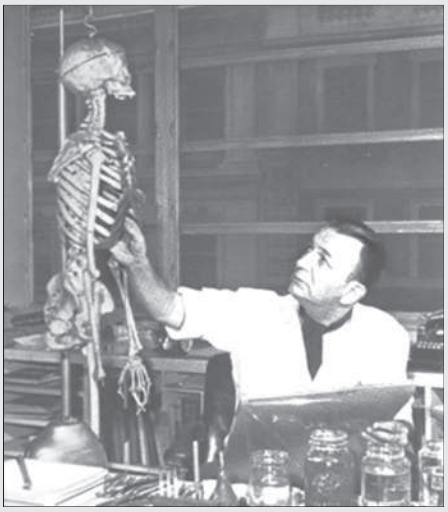
Terminology Updates

The *Atlas of Human Anatomy* uses terminology accepted (in Göttingen, Germany, on September 24, 2016) by the Federative International Programme on Anatomical Terminologies and published as updates to the 1998 *Terminologia Anatomica*. Numerous updates to terminology have been made, so in select cases, former terminology has been included within parentheses to assist with the transition.

New Radiologic Images

Over 50 radiologic images—some completely new views and others replacing existing views using newer imaging tools—are included in this edition. Images have been selected based on their utility to students studying gross anatomy.

Your *Atlas of Human Anatomy* content has been updated, created, and overseen by a team of dedicated and passionate consulting editors, with the help of a stellar international advisory board, and guided by the feedback of many students, educators, anatomists, and clinicians that love Netter's *Atlas*. Please feel free to comment on the Netter Images Facebook page or Twitter feeds or email us directly with your thoughts, suggestions, or questions at NetterAppFeedback@Elsevier.com.



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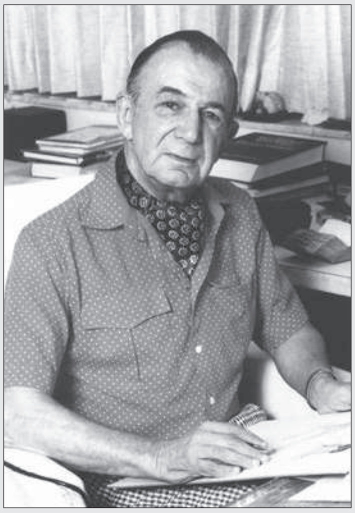


To my dear wife, Vera

PREFACE TO THE FIRST EDITION

I have often said that my career as a medical artist for almost 50 years has been a sort of "command performance" in the sense that it has grown in response to the desires and requests of the medical profession. Over these many years, I have produced almost 4,000 illustrations, mostly for *The CIBA* (now *Netter*) *Collection of Medical Illustrations* but also for *Clinical Symposia.* These pictures have been concerned with the varied subdivisions of medical knowledge such as gross anatomy, histology, embryology, physiology, pathology, diagnostic modalities, surgical and therapeutic techniques, and clinical manifestations of a multitude of diseases. As the years went by, however, there were more and more requests from physicians and students for me to produce an atlas purely of gross anatomy. Thus, this atlas has come about, not through any inspiration on my part but rather, like most of my previous works, as a fulfillment of the desires of the medical profession.

It involved going back over all the illustrations I had made over so many years, selecting those pertinent to gross anatomy, classifying them and organizing them by system and region, adapting them to page size and space, and arranging them in logical sequence. Anatomy of course does not change, but our understanding of anatomy and its clinical significance does change, as do anatomical terminology and nomenclature. This therefore required much updating of many of the older pictures and even revision of a number of them in order to make them more pertinent to today's ever-expanding scope of medical and surgical practice. In addition, I found that there were gaps in the portrayal of medical knowledge as pictorialized in the illustrations I had previously done, and this necessitated my making a number of new pictures that are included in this volume.

In creating an atlas such as this, it is important to achieve a happy medium between complexity and simplification. If the pictures are too complex, they may be difficult and confusing to read; if oversimplified, they may not be adequately definitive or may even be misleading. I have therefore striven for a middle course of realism without the clutter of confusing minutiae. I hope that the students and members of the medical and allied professions will find the illustrations readily understandable, yet instructive and useful.

At one point, the publisher and I thought it might be nice to include a foreword by a truly outstanding and renowned anatomist, but there are so many in that category that we could not make a choice. We did think of men like Vesalius, Leonardo da Vinci, William Hunter, and Henry Gray, who of course are unfortunately unavailable, but I do wonder what their comments might have been about this atlas.

Frank H. Netter, MD
(1906–1991)

FRANK H. NETTER, MD

Frank H. Netter was born in New York City in 1906. He studied art at the Art Students League and the National Academy of Design before entering medical school at New York University, where he received his Doctor of Medicine degree in 1931. During his student years, Dr. Netter's notebook sketches attracted the attention of the medical faculty and other physicians, allowing him to augment his income by illustrating articles and textbooks. He continued illustrating as a sideline after establishing a surgical practice in 1933, but he ultimately opted to give up his practice in favor of a full-time commitment to art. After service in the United States Army during World War II, Dr. Netter began his long collaboration with the CIBA Pharmaceutical Company (now Novartis Pharmaceuticals). This 45-year partnership resulted in the production of the extraordinary collection of medical art so familiar to physicians and other medical professionals worldwide.

Icon Learning Systems acquired the Netter Collection in July 2000 and continued to update Dr. Netter's original paintings and to add newly commissioned paintings by artists trained in the style of Dr. Netter. In 2005, Elsevier Inc. purchased the Netter Collection and all publications from Icon Learning Systems. There are now over 50 publications featuring the art of Dr. Netter available through Elsevier Inc.

Dr. Netter's works are among the finest examples of the use of illustration in the teaching of medical concepts. The 13-book *Netter Collection of Medical Illustrations,* which includes the greater part of the more than 20,000 paintings created by Dr. Netter, became and remains one of the most famous medical works ever published. *The Netter Atlas of Human Anatomy,* first published in 1989, presents the anatomic paintings from the Netter Collection. Now translated into 16 languages, it is the anatomy atlas of choice among medical and health professions students the world over.

The Netter illustrations are appreciated not only for their aesthetic qualities, but, more importantly, for their intellectual content. As Dr. Netter wrote in 1949 "clarification of a subject is the aim and goal of illustration. No matter how beautifully painted, how delicately and subtly rendered a subject may be, it is of little value as a *medical illustration* if it does not serve to make clear some medical point." Dr. Netter's planning, conception, point of view, and approach are what inform his paintings and what make them so intellectually valuable.

Frank H. Netter, MD, physician and artist, died in 1991.

ACKNOWLEDGMENTS

Carlos A. G. Machado, MD

I struck luck when joining this golden team of consulting editors exceedingly knowledgeable in the fields of clinical anatomy and medical education. It has been a great honor to work with and be under their guidance, as well as under the highly competent coordination of Elyse O'Grady and Marybeth Thiel, Elsevier's Executive Content Strategist and Senior Content Development Specialist, respectively.

This unique book would not exist without the genius of its creator, Dr. Frank Netter, to whom I owe special thanks, also in the name of generations of students and health professionals who, like myself, have learned so much from his incommensurable body of work.

I dedicate my work and express my most sincere thanks to my beloved parents, Carlos and Neide, who provided me with the foundation of my education; to my patient wife, Adriana, and talented daughter, Beatriz, for their love and support; to the students, teachers, and health professionals who rely on my work to learn and teach; to all the body donors and living friends that have respectively been the subjects of my studies and models of most of the illustrations I have created for the *Atlas*; and to my teachers Eugênio Cavalcante, Mário Fortes, and Paulo Carneiro for taking my interest in human/clinical anatomy much further.

John T. Hansen, PhD

At Elsevier I would like to thank Marybeth Thiel, Senior Content Development Specialist, Elyse O'Grady, Executive Content Strategist, John Casey, Senior Project Manager, Patricia Tannian, Publishing Services Manager, Julia Dummitt, Design Manager, Karen Giacomucci, Illustration Buyer, and Madelene Hyde, Publishing Director, for their continuous support and meticulous attention to detail during the development of this seventh edition of the *Atlas of Human Anatomy*. They, along with the entire editorial, production, design, and marketing teams at Elsevier have been a delight to work with and to know. I also wish to thank my consulting editors for their insightful and constructive suggestions as we strive to make every new edition of the *Atlas* better. I am also indebted to Carlos Machado for his superb artistic skill in producing and updating a number of plates that appear in this latest edition of the *Atlas*. His renderings of human anatomy are the perfect complement to the Netter images. In addition to my fellow editors, I wish to express my thanks to my faculty colleagues at Rochester and to all my past and present students who have provided generous and constructive feedback and have enriched my life. Finally, I am indebted to my entire family for their continued support and especially to my wife, Paula. Their love and encouragement sustains me and is the source of all the happiness and joy I know.

Brion Benninger, MD, MSc

Every day I am thankful for my wife, Alison, and son, Jack, for the laughs we have as a family, often from my follies, which is such a tonic. I thank Elsevier, especially Marybeth Thiel, Elyse O'Grady, and Madelene Hyde for their professionalism and guidance, enabling John Hansen, Carlos Machado, and my fellow coeditors to work in a unique and dynamic environment. I thank those clinicians who trained me, especially my early gifted surgeon/anatomist/teacher mentors, Drs. Gerald Tressidor and Harold Ellis CBE (Cambridge & Guy's Hospital); Dr. S. Standring, who embodies professionalism and displays fortitude; Drs. P. Crone and J. Heatherington, and the University Board for their stellar support; my past and future students and patients; and clinical colleagues from all corners of the world who keep anatomy dynamic, fresh, and wanting more. Special thanks to Jim Diegel and Erik Szeto, friends, mentors and fellow visionaries who also see "outside the box," challenging status quo. A heartfelt tribute to my late mentors, friends, and sister, Jim McDaniel, Bill Bryan, and Gail Hendricks, all who represent what is good in teaching, caring, and healing. They made this world a wee bit better. Lastly, I thank my mother for her love of education and equality and my father for his inquisitive and creative mind.

Jennifer Brueckner-Collins, PhD

Many thanks to the Elsevier team, particularly Marybeth Thiel and Elyse O'Grady, for their guidance and expertise during our preparation of the seventh edition. It is always an honor to work with Carlos Machado, whose passion for and mastery of the art of clinical anatomy and medicine never cease to amaze me. I am forever indebted to Brian MacPherson, who has served as a teacher, mentor, and friend to me for more than 20 years….you showed me what it means to be a true educator and I have been so fortunate to have the opportunity to build a career based on those principles. To Kurt and Lincoln, you are my inspiration….my world…my life and I love you to the snow moon and back.

Todd M. Hoagland, PhD

It is a privilege to teach clinical human anatomy and I am eternally grateful to all the body donors and their families for enabling healthcare professionals to train in the dissection laboratory. It is my honor to work with outstanding medical students and colleagues at the Medical College of Wisconsin. I am grateful to John Hansen and the professionals of the Elsevier team for the opportunity to be a steward of the incomparable Netter's *Atlas*. Marybeth Thiel and Elyse O'Grady were especially helpful and a pleasure to work with. It was an honor to collaborate with the brilliant Carlos Machado and all the consulting editors. I thank Bill Swartz and Mark Moss for being outstanding mentors, and I thank all of the graduate students I've worked with, especially Rebecca Lufler. I am deeply appreciative of Stan Hillman and Jack O'Malley for inspiring me with masterful teaching and rigorous expectations. I am indebted to Gary Kolesari and Richard Hoyt Jr. for helping me become a competent clinical anatomist, and to Rob Bouchie for his camaraderie. I am most grateful to my brother, Bill, for his unwavering optimism and gregarious nature. I thank my mother, Liz, for her dedication and love and for instilling a strong work ethic. Finally, I am humbled by my two awesome children, Ella and Caleb, for helping me redefine love, wonder, and joy.

R. Shane Tubbs, MS, PA-C, PhD

Elsevier and the Netter team have once again been a joy to work with. I thank Elyse O'Grady, Marybeth Thiel, and John Casey for their tremendous work on this edition. In addition, Carlos Machado has again added his expertise to bringing his anatomical images to life. As always, my work is inspired by my beautiful wife, Susan, and son, Isaiah. Lastly, I am indebted to my parents, Richard and Karon Tubbs, who supported me in my career to better understand the human body.

CONTENTS

SECTION 1 INTRODUCTION • Plates 1-7

Introduction • Plates 1-7

1 Body Planes and Terms of Relationship
2 Surface Anatomy: Regions (Anterior View of Female)
3 Surface Anatomy: Regions (Posterior View of Male)
4 Major Arteries and Pulse Points
5 Major Systemic Veins of the Cardiovascular System
6 General Organization of the Nervous System
7 Overview of the Lymphatic System

Electronic Bonus Plates • Plates BP1-BP16

BP 1 Cross Section of Skin
BP 2 Pilosebaceous Unit
BP 3 Major Body Cavities
BP 4 Skeletal System: Axial and Appendicular Skeletons
BP 5 Types of Synovial Joints
BP 6 Joints: Connective Tissues and Articular Cartilage
BP 7 Architecture of Bone
BP 8 Muscular System
BP 9 Overview of the Gastrointestinal System
BP 10 Overview of the Endocrine System
BP 11 Neurons and Synapses
BP 12 Features of a Typical Peripheral Nerve
BP 13 Sites of Visceral Referred Pain
BP 14 General Organization of the Cardiovascular System
BP 15 Cardiovascular System: Composition of Blood
BP 16 Arterial Wall

SECTION 2 HEAD AND NECK • Plates 8-160

Surface Anatomy • Plate 8

8 Head and Neck: Surface Anatomy

Superficial Head and Neck • Plates 9-10

9 Cutaneous Nerves of Head and Neck
10 Superficial Arteries and Veins of Face and Scalp

Bones and Ligaments • Plates 11-30

11 Skull: Anterior View
12 Skull: Radiographs
13 Skull: Lateral View
14 Skull: Lateral Radiograph
15 Skull: Midsagittal Section
16 Calvaria
17 Cranial Base: Inferior View
18 Cranial Base: Superior View
19 Foramina and Canals of Cranial Base: Inferior View
20 Foramina and Canals of Cranial Base: Superior View
21 Skull of Newborn
22 Bony Framework of Head and Neck
23 Pterygoid Fossae
24 Mandible
25 Temporomandibular Joint
26 Cervical Vertebrae: Atlas and Axis
27 Cervical Vertebrae (continued)
28 Cervical Vertebrae: Uncovertebral Joints
29 External Craniocervical Ligaments
30 Internal Craniocervical Ligaments

Neck • Plates 31-41

31 Muscles of Facial Expression: Lateral View
32 Muscles of Neck: Anterior View
33 Fascial Layers of Neck
34 Cervical Fasciae
35 Infrahyoid and Suprahyoid Muscles
36 Muscles of Neck: Lateral View
37 Anterior and Lateral Cervical Muscles
38 Superficial Veins and Cutaneous Nerves of Neck
39 Nerves and Vessels of Neck
40 Nerves and Vessels of Neck (continued)
41 Carotid Arteries

Nasal Region • Plates 42-64

42 Nose
43 Lateral Wall of Nasal Cavity
44 Lateral Wall of Nasal Cavity (continued)
45 Medial Wall of Nasal Cavity (Nasal Septum)
46 Nerves of Nasal Cavity
47 Arteries of Nasal Cavity: Bony Nasal Septum Turned Up
48 Nerves of Nasal Cavity: Bony Nasal Septum Turned Up
49 Nose and Maxillary Sinus: Transverse Section
50 Paranasal Sinuses: Coronal and Transverse Sections
51 Paranasal Sinuses: Parasagittal Views
52 Paranasal Sinuses: Changes with Age

53 Salivary Glands
54 Facial Nerve Branches and Parotid Gland
55 Muscles Involved in Mastication
56 Muscles Involved in Mastication (continued)
57 Maxillary Artery
58 Proximal Maxillary and Superficial Temporal Arteries
59 Mandibular Nerve (CN V_3)
60 Superior View of Infratemporal Fossa
61 Ophthalmic (CN V_1) and Maxillary (CN V_2) Nerves
62 Autonomic Innervation of Nasal Cavity
63 Nerves and Arteries of the Deep Face
64 Orientation of Nerves and Vessels of the Cranial Base

Oral Region • Plates 65-74

65 Inspection of Oral Cavity
66 Afferent Innervation of Oral Cavity and Tongue
67 Roof of Oral Cavity
68 Tongue and Salivary Glands: Sections
69 Floor of Oral Cavity
70 Tongue
71 Tongue (continued)
72 Fauces
73 Teeth
74 Teeth (continued)

Pharynx • Plates 75-86

75 Muscles of Pharynx: Partially Opened Posterior View
76 Posterior View of Pharynx: Nerves and Vessels
77 Pharynx: Medial View
78 Muscles of Pharynx: Medial View
79 Pharynx: Opened Posterior View
80 Pharyngoesophageal Junction
81 Muscles of Pharynx: Lateral View
82 Nerves of Oral, Head, and Neck Regions
83 Arteries of Oral and Pharyngeal Regions
84 Veins of Face and Neck Regions
85 Lymph Vessels and Nodes of Head and Neck
86 Lymph Vessels and Nodes of Pharynx and Tongue

Thyroid Gland and Larynx • Plates 87-93

87 Thyroid Gland: Anterior View
88 Thyroid Gland and Pharynx: Posterior View
89 Parathyroid Glands
90 Cartilages of Larynx
91 Intrinsic Muscles of Larynx
92 Nerves and Coronal Section of Larynx
93 Action of Intrinsic Muscles of Larynx

Orbit and Contents • Plates 94-104

94 Eyelids
95 Lacrimal Apparatus
96 Extrinsic Eye Muscles
97 Nerves of Orbit
98 Superior and Anterior Views of Orbit
99 Arteries and Veins of Orbit and Eyelids
100 Eyeball: Transverse Section
101 Anterior and Posterior Chambers of Eyeball
102 Lens and Supporting Structures
103 Intrinsic Arteries and Veins of Eye
104 Vascular Supply of Eye

Ear • Plates 105-110

105 Ear and Course of Sound in Cochlea
106 External Ear and Tympanic Cavity
107 Tympanic Cavity
108 Bony and Membranous Labyrinths
109 Bony and Membranous Labyrinths (continued)
110 Orientation of Labyrinths in Skull

Meninges and Brain • Plates 111-126

111 Meninges and Diploic Veins
112 Meningeal Arteries
113 Meninges and Superficial Cerebral Veins
114 Dural Venous Sinuses: Sagittal Section
115 Dural Venous Sinuses (continued)
116 Brain: Lateral Views
117 Brain: Medial Views
118 Brain: Inferior View
119 Ventricles of Brain
120 Circulation of Cerebrospinal Fluid
121 Basal Nuclei (Ganglia)
122 Thalamus and Related Structures
123 Hippocampus and Fornix
124 Brain Stem
125 Ventricles and Cerebellum
126 Cerebellum

Cranial and Cervical Nerves • Plates 127-146

127 Cranial Nerve Nuclei in Brain Stem: Schema
128 Cranial Nerve Nuclei in Brain Stem: Schema (continued)
129 Cranial Nerves (Motor and Sensory Distribution): Schema
130 Olfactory Nerve (CN I): Schema
131 Optic Nerve (CN II) (Visual Pathway): Schema

132 Oculomotor (CN III), Trochlear (CN IV), and Abducens (CN VI) Nerves: Schema
133 Trigeminal Nerve (CN V): Schema
134 Facial Nerve (CN VII): Schema
135 Vestibulocochlear Nerve (CN VIII): Schema
136 Glossopharyngeal Nerve (CN IX): Schema
137 Vagus Nerve (CN X): Schema
138 Accessory Nerve (CN XI): Schema
139 Hypoglossal Nerve (CN XII): Schema
140 Cervical Plexus: Schema
141 Autonomic Nerves in Neck
142 Autonomic Nerves in Head
143 Ciliary Ganglion: Schema
144 Pterygopalatine and Submandibular Ganglia: Schema
145 Otic Ganglion: Schema
146 Taste Pathways: Schema

Cerebral Vasculature • Plates 147-158

147 Arteries to Brain and Meninges
148 Internal Carotid Artery in Petrous Part of Temporal Bone
149 Arteries to Brain: Schema
150 Arteries of Brain: Inferior Views
151 Cerebral Arterial Circle (of Willis)
152 Arteries of Brain: Frontal View and Section
153 Arteries of Brain: Lateral and Medial Views
154 Arteries of Posterior Cranial Fossa
155 Veins of Posterior Cranial Fossa
156 Deep Veins of Brain
157 Subependymal Veins of Brain
158 Hypothalamus and Hypophysis

Regional Imaging • Plates 159-160

159 Cranial Imaging (MRA and MRV)
160 Cranial Imaging (MRI)

Structures with High Clinical Significance • Tables 2.1-2.3

Muscle Tables • Tables 2.4-2.9

Electronic Bonus Plates • Plates BP17-BP32

BP17 3D Skull Reconstruction CTs
BP18 Degenerative Changes in Cervical Vertebrae
BP19 Atlantooccipital Junction
BP20 Muscles of Facial Expression: Anterior View
BP21 Musculature of Face
BP22 Paranasal Sinuses

BP23 Subclavian Artery
BP24 Opening of the Mandible
BP25 Afferent Innervation of Oral Cavity and Pharynx
BP26 Fasciae of Orbit and Eyeball
BP27 Tympanic Cavity
BP28 Anatomy of the Pediatric Ear
BP29 Auditory Tube (Eustachian)
BP30 Arteries and Veins of Hypothalamus and Hypophysis
BP31 Cranial Imaging (MRV and MRA)
BP32 Axial and Coronal MRIs of Brain

SECTION 3 BACK AND SPINAL CORD • Plates 161-186

Surface Anatomy • Plate 161

161 Back: Surface Anatomy

Bones and Ligaments • Plates 162-168

162 Vertebral Column
163 Thoracic Vertebrae
164 Lumbar Vertebrae
165 Vertebrae: Radiograph and MRI
166 Sacrum and Coccyx
167 Vertebral Ligaments: Lumbosacral Region
168 Vertebral Ligaments: Lumbar Region

Spinal Cord • Plates 169-179

169 Spinal Cord and Anterior Rami
170 Relation of Spinal Nerve Roots to Vertebrae
171 Dermatomes
172 Sympathetic Nervous System: Schema
173 Parasympathetic Nervous System: Schema
174 Spinal Meninges and Nerve Roots
175 Spinal Nerve Origin: Cross Sections
176 Arteries of Spinal Cord: Schema
177 Arteries of Spinal Cord: Intrinsic Distribution
178 Veins of Spinal Cord and Vertebral Column
179 Veins of Vertebral Column: Vertebral Veins

Muscles and Nerves • Plates 180-184

180 Muscles of Back: Superficial Layer
181 Muscles of Back: Intermediate Layer
182 Muscles of Back: Deep Layer
183 Nerves of Back
184 Suboccipital Triangle

Cross-Sectional Anatomy • Plates 185-186

185 Lumbar Region of Back: Cross Section
186 Typical Thoracic Spinal Nerve: Cross Section

Structures with High Clinical Significance • Table 3.1

Muscle Tables • Tables 3.2-3.3

Electronic Bonus Plates • Plates BP33-BP43

BP33 Vertebral Ligaments
BP34 Cervical Spine: Radiographs
BP35 Cervical Spine: MRI and Radiograph
BP36 Thoracolumbar Spine: Lateral Radiograph
BP37 Lumbar Vertebrae: Radiographs
BP38 Lumbar Spine: MRIs
BP39 Sympathetic Nervous System: General Topography
BP40 Parasympathetic Nervous System: General Topography
BP41 Cholinergic and Adrenergic Synapses: Schema
BP42 Vertebral Veins: Detail Showing Venous Communications
BP43 Spinal Cord Cross Sections: Fiber Tracts

SECTION 4 THORAX • Plates 187-248

Surface Anatomy • Plate 187

187 Thorax: Surface Anatomy

Mammary Gland • Plates 188-191

188 Mammary Gland
189 Arteries of Mammary Gland
190 Lymph Vessels and Nodes of Mammary Gland
191 Lymphatic Drainage of Breast

Body Wall • Plates 192-201

192 Bony Framework of Thorax
193 Ribs and Associated Joints
194 Anterior Thoracic Wall
195 Anterior Thoracic Wall (continued)
196 Anterior Thoracic Wall: Internal View
197 Intercostal Nerves and Arteries
198 Veins of Internal Thoracic Wall
199 Phrenic Nerve
200 Respiratory Diaphragm: Thoracic Surface
201 Respiratory Diaphragm: Abdominal Surface

Lungs • Plates 202-214

202 Topography of Lungs: Anterior View
203 Topography of Lungs: Posterior View
204 Lungs in Situ: Anterior View
205 Lungs: Medial Views
206 Bronchopulmonary Segments
207 Bronchopulmonary Segments (continued)
208 Trachea and Major Bronchi
209 Bronchi and Intrapulmonary Airways
210 Great Vessels of Superior Mediastinum
211 Bronchial Arteries and Veins
212 Lymph Vessels and Nodes of Lung
213 Autonomic Nerves of Thorax
214 Innervation of Tracheobronchial Tree: Schema

Heart • Plates 215-233

215 Heart in Situ
216 Heart: Anterior Exposure
217 Heart: Radiographs and CT Angiogram; Auscultation of Heart
218 Heart: Base and Diaphragmatic Surface
219 Pericardial Sac
220 Mediastinum: Cross Section
221 Thorax: Coronal Section of Heart and Ascending Aorta
222 Coronary Arteries and Cardiac Veins
223 Coronary Arteries: Imaging
224 Right Atrium and Ventricle
225 Left Atrium and Ventricle
226 Valves and Fibrous Skeleton of Heart
227 Valves and Fibrous Skeleton of Heart (continued)
228 Atria, Ventricles, and Interventricular Septum
229 Conducting System of Heart
230 Nerves of Thorax
231 Innervation of Heart: Schema
232 Innervation of Blood Vessels: Schema
233 Prenatal and Postnatal Circulation

Mediastinum • Plates 234-243

234 Mediastinum: Right Lateral View
235 Mediastinum: Left Lateral View
236 Esophagus in Situ
237 Topography and Constrictions of Esophagus
238 Musculature of Esophagus
239 Esophagogastric Junction
240 Arteries of Esophagus
241 Veins of Esophagus
242 Lymph Vessels and Nodes of Esophagus
243 Nerves of Esophagus

Regional Scans • Plate 244

244 Chest Scans: Axial CT Images

Cross-Sectional Anatomy • Plates 245-248

245 Cross Section of Thorax at T3 Level
246 Cross Section of Thorax at T3-4 Disc Level
247 Cross Section of Thorax at T4-5 Disc Level
248 Cross Section of Thorax at T7 Level

Structures with High Clinical Significance • Tables 4.1-4.2

Muscle Table • Table 4.3

Electronic Bonus Plates • Plates BP44-BP57

BP44 Respiratory System
BP45 Cervical Ribs and Related Anomalies
BP46 Muscle Attachments of Ribs
BP47 Muscles of Respiration
BP48 Intrapulmonary Airways: Schema
BP49 Intrapulmonary Blood Circulation: Schema
BP50 Gas Exchange
BP51 Anterior Aspect of Heart
BP52 Coronary Arteries: Right Anterior Oblique Views with Arteriograms
BP53 Coronary Arteries and Cardiac Veins: Variations
BP54 Intrinsic Nerves and Variations in Nerves of Esophagus
BP55 Arteries of Esophagus: Variations
BP56 Thorax: Coronal Section (Midaxillary Line, Tracheal Bifurcation, Left Atrium)
BP57 Thorax: Coronal CTs

SECTION 5 ABDOMEN • Plates 249-332

Surface Anatomy • Plate 249

249 Abdomen: Surface Anatomy

Body Wall • Plates 250-269

250 Bony Framework of Abdomen
251 Regions and Planes of Abdomen
252 Anterior Abdominal Wall: Superficial Dissection
253 Anterior Abdominal Wall: Intermediate Dissection
254 Anterior Abdominal Wall: Deep Dissection
255 Rectus Sheath: Cross Section
256 Anterior Abdominal Wall: Internal View

257 Posterolateral Abdominal Wall
258 Arteries of Anterior Abdominal Wall
259 Veins of Anterior Abdominal Wall
260 Nerves of Anterior Abdominal Wall
261 Thoracoabdominal Nerves
262 Inguinal Region: Dissections
263 Inguinal Canal and Spermatic Cord
264 Femoral Sheath and Inguinal Canal
265 Posterior Abdominal Wall: Internal View
266 Arteries of Posterior Abdominal Wall
267 Veins of Posterior Abdominal Wall
268 Lymph Vessels and Nodes of Posterior Abdominal Wall
269 Nerves of Posterior Abdominal Wall

Peritoneal Cavity • Plates 270-275

270 Greater Omentum and Abdominal Viscera
271 Mesenteric Relations of Intestines
272 Mesenteric Relations of Intestines (continued)
273 Omental Bursa: Stomach Reflected
274 Omental Bursa: Cross Section
275 Peritoneum of Posterior Abdominal Wall

Viscera (Gut) • Plates 276-283

276 Stomach in Situ
277 Mucosa of Stomach
278 Duodenum in Situ
279 Mucosa and Musculature of Small Intestine
280 Ileocecal Region
281 Ileocecal Region (continued)
282 (Vermiform) Appendix
283 Mucosa and Musculature of Large Intestine

Viscera (Accessory Organs) • Plates 284-289

284 Surfaces and Bed of Liver
285 Liver in Situ: Vascular and Duct Systems
286 Liver Structure: Schema
287 Gallbladder, Extrahepatic Bile Ducts, and Pancreatic Duct
288 Pancreas in Situ
289 Spleen

Visceral Vasculature • Plates 290-299

290 Arteries of Stomach, Liver, and Spleen
291 Arteries of Liver, Pancreas, Duodenum, and Spleen
292 Celiac Arteriogram and CT Angiogram
293 Arteries of Duodenum and Head of Pancreas
294 Arteries of Small Intestine
295 Arteries of Large Intestine

296 Veins of Stomach, Duodenum, Pancreas, and Spleen
297 Veins of Small Intestine
298 Veins of Large Intestine
299 Hepatic Portal Vein Tributaries: Portacaval Anastomoses

Innervation • Plates 300-310

300 Autonomic Nerves and Ganglia
301 Autonomic Innervation of Stomach and Duodenum
302 Autonomic Innervation of Stomach and Duodenum (continued)
303 Autonomic Innervation of Esophagus, Stomach, and Duodenum: Schema
304 Autonomic Innervation of Small Intestine
305 Autonomic Innervation of Large Intestine
306 Autonomic Innervation of Intestines: Schema
307 Autonomic Reflex Pathways: Schema
308 Enteric Plexuses of Intestine
309 Autonomic Innervation of Liver: Schema
310 Autonomic Innervation of Pancreas: Schema

Kidneys and Suprarenal Glands • Plates 311-324

311 Kidneys in Situ: Anterior Views
312 Kidneys in Situ: Posterior Views
313 Renal Artery and Vein in Situ
314 Gross Structure of Kidney
315 Intrarenal Arteries and Renal Segments
316 Ureters in Abdomen and Pelvis
317 Arteries of Ureters and Urinary Bladder
318 Renal Fasciae
319 Lymph Vessels and Nodes of Kidneys and Urinary Bladder
320 Autonomic Nerves of Kidneys, Ureters, and Urinary Bladder
321 Autonomic Innervation of Kidneys and Upper Ureters: Schema
322 Autonomic Nerves of Suprarenal Glands: Dissection and Schema
323 Arteries and Veins of Suprarenal Glands in Situ
324 Abdominal Wall and Viscera: Paramedian (Parasagittal) Section

Lymphatics • Plate 325

325 Abdominal and Pelvic Lymphatics: Schema

Regional Scans • Plates 326-327

326 Abdominal Scans: Axial CT Images
327 Abdominal Scans: Axial CT Images (continued)

Cross-Sectional Anatomy • Plates 328-332

328 Cross Section at T10, Esophagogastric Junction
329 Cross Section at T12, Inferior to Xiphoid
330 Cross Section at T12–L1, Intervertebral Disc
331 Cross Section at L1–2, Intervertebral Disc
332 Cross Section at L3–4

Structures with High Clinical Significance • Tables 5.1-5.2

Muscle Table • Table 5.3

Electronic Bonus Plates • Plates BP58-BP87

BP58 Inguinal and Femoral Regions
BP59 Indirect Inguinal Hernia
BP60 Variations in Position and Contour of Stomach in Relation to Body Habitus
BP61 Layers of Duodenal Wall
BP62 CT and MRCP Showing Appendix, Gallbladder, and Ducts; Nerve Branches of Hepatic Artery
BP63 Topography of Liver
BP64 Variations in Form of Liver
BP65 Sigmoid Colon: Variations in Position
BP66 Variations in Arterial Supply to Cecum and Posterior Peritoneal Attachment of Cecum
BP67 Variations in Pancreatic Duct
BP68 Variations in Cystic, Hepatic, and Pancreatic Ducts
BP69 Variations in Cystic Arteries
BP70 Variations in Hepatic Arteries
BP71 Variations and Anomalies of Hepatic Portal Vein
BP72 Variations in Celiac Trunk
BP73 Variations in Colic Arteries
BP74 Variations in Colic Arteries (continued)
BP75 Variations in Renal Artery and Vein
BP76 Histology of Renal Corpuscle
BP77 Nephron and Collecting Tubule: Schema
BP78 Blood Vessels in Parenchyma of Kidney: Schema
BP79 Lymph Vessels and Nodes of Stomach
BP80 Lymph Vessels and Nodes of Pancreas
BP81 Lymph Vessels and Nodes of Small Intestine
BP82 Lymph Vessels and Nodes of Large Intestine
BP83 Lymph Vessels and Nodes of Liver
BP84 Schematic Cross Section of Abdomen at Middle T12
BP85 Transverse Section of Abdomen: Level of L5, Near Transtubercular Plane
BP86 Transverse Section of Abdomen: Level of S1, Anterior Superior Iliac Spine
BP87 Axial CT Image of Upper Abdomen

SECTION 6 PELVIS AND PERINEUM • Plates 333-401

Surface Anatomy • Plate 333

333 Pelvis and Perineum: Surface Anatomy

Bones and Ligaments • Plates 334-338

334 Bony Framework of Pelvis
335 Male and Female Pelvis: Radiographs
336 Sex Differences of Pelvis: Measurements
337 Bones and Ligaments of Pelvis
338 Bones and Ligaments of Pelvis (continued)

Pelvic Floor and Contents • Plates 339-349

339 Pelvic Diaphragm: Female
340 Pelvic Diaphragm: Female (continued)
341 Pelvic Diaphragm: Female (continued)
342 Pelvic Diaphragm: Male
343 Pelvic Diaphragm: Male (continued)
344 Pelvic Contents: Female
345 Pelvic Viscera and Perineum: Female
346 Pelvic Viscera: Female
347 Endopelvic Fascia and Potential Spaces
348 Pelvic Contents: Male
349 Pelvic Viscera and Perineum: Male

Urinary Bladder • Plates 350-352

350 Urinary Bladder: Orientation and Supports
351 Female Sphincters
352 Urinary Bladder: Female and Male

Uterus, Vagina, and Supporting Structures • Plates 353-357

353 Uterus, Vagina, and Supporting Structures
354 Uterus: Fascial Ligaments
355 Uterus and Adnexa
356 Female Pelvic Relationships
357 Pelvic Ligaments

Perineum and External Genitalia: Female • Plates 358-361

358 Female Perineum and External Genitalia (Pudendum or Vulva)
359 Female Perineum (Superficial Dissection)
360 Female Perineum and Deep Perineum
361 Female Perineal Spaces

Perineum and External Genitalia: Male • Plates 362-369

362 Male Perineum and External Genitalia (Superficial Dissection)
363 Male Perineum and External Genitalia (Deeper Dissection)
364 Penis
365 Male Perineal Spaces
366 Prostate Gland and Seminal Vesicles
367 Urethra
368 Descent of Testis
369 Scrotum and Contents

Homologues of Genitalia • Plates 370-371

370 Homologues of External Genitalia
371 Homologues of Internal Genitalia

Testis, Epididymis, and Ductus Deferens • Plate 372

372 Testis, Epididymis, and Ductus Deferens

Rectum • Plates 373-378

373 Rectum in Situ: Female and Male
374 Ischioanal Fossae
375 Rectum and Anal Canal
376 Anorectal Musculature
377 External Anal Sphincter Muscle: Perineal Views
378 Actual and Potential Perineopelvic Spaces

Regional Scan • Plate 379

379 Pelvic Scans: Sagittal T2-Weighted MRIs

Vasculature • Plates 380-390

380 Arteries of Rectum and Anal Canal: Male Posterior View
381 Veins of Rectum and Anal Canal: Female Anterior View
382 Arteries and Veins of Pelvic Organs: Female Anterior View
383 Arteries and Veins of Testis: Anterior View
384 Arteries of Pelvis: Female
385 Arteries and Veins of Pelvis: Male
386 Arteries and Veins of Perineum and Uterus
387 Arteries and Veins of Perineum: Male
388 Lymph Vessels and Nodes of Pelvis and Genitalia: Female
389 Lymph Vessels and Nodes of Perineum: Female
390 Lymph Vessels and Nodes of Pelvis and Genitalia: Male

Innervation • Plates 391-399

391 Nerves of External Genitalia: Male
392 Nerves of Pelvic Viscera: Male
393 Nerves of Perineum: Male

394 Nerves of Pelvic Viscera: Female
395 Nerves of Perineum and External Genitalia: Female
396 Neuropathways in Parturition
397 Innervation of Female Reproductive Organs: Schema
398 Innervation of Male Reproductive Organs: Schema
399 Innervation of Urinary Bladder and Lower Ureter: Schema

Cross-Sectional Anatomy • Plates 400-401

400 Male Pelvis: Cross Section of Bladder–Prostate Gland Junction
401 Female Pelvis: Cross Section of Vagina and Urethra

Structures with High Clinical Significance • Tables 6.1-6.2

Muscle Tables • Tables 6.3-6.4

Electronic Bonus Plates • Plates BP88-BP98

BP88 Fasciae of Male and Female Pelvis and Perineum
BP89 Male and Female Cystourethrograms
BP90 Female Urethra
BP91 Genetics of Reproduction
BP92 Menstrual Cycle
BP93 Testes
BP94 Uterine Development
BP95 Ovary, Ova, and Follicles
BP96 Variations in Hymen
BP97 Cross Section Through Prostate
BP98 Arteries and Veins of Pelvis: Male

SECTION 7 UPPER LIMB • Plates 402-470

Surface Anatomy • Plate 402

402 Upper Limb: Surface Anatomy

Cutaneous Anatomy • Plates 403-407

403 Dermatomes of Upper Limb and Segmental Nerve Function
404 Cutaneous Innervation of Upper Limb
405 Cutaneous Nerves and Superficial Veins of Proximal Upper Limb
406 Cutaneous Nerves and Superficial Veins of Forearm and Hand
407 Lymph Vessels and Nodes of Upper Limb

Shoulder and Axilla • Plate 408-420

408 Clavicle and Sternoclavicular Joint
409 Humerus and Scapula: Anterior Views
410 Humerus and Scapula: Posterior Views
411 Shoulder: Anteroposterior Radiograph
412 Shoulder with Details of Glenohumeral Joint
413 Muscles of Shoulder
414 Axilla: Posterior Wall
415 Muscles of Rotator (Compressor) Cuff
416 Pectoral, Clavipectoral, and Axillary Fasciae
417 Scapulothoracic and Shoulder Dissection
418 Axillary Artery and Anastomoses Around Scapula
419 Axilla: Anterior View
420 Brachial Plexus: Schema

Arm • Plates 421-425

421 Muscles of Arm: Anterior Views
422 Muscles of Arm: Posterior Views
423 Brachial Artery in Situ
424 Arteries of Arm and Proximal Forearm
425 Arm: Serial Cross Sections

Elbow and Forearm • Plates 426-441

426 Bones of Elbow
427 Elbow: Radiographs
428 Ligaments of Elbow
429 Bones of Forearm
430 Individual Muscles of Forearm: Rotators of Radius
431 Individual Muscles of Forearm: Extensors of Wrist and Digits
432 Individual Muscles of Forearm: Flexors of Wrist
433 Individual Muscles of Forearm: Flexors of Digits
434 Muscles of Forearm (Superficial Layer): Posterior View
435 Muscles of Forearm (Deeper Layer): Posterior View
436 Muscles of Forearm (Superficial Layer): Anterior View
437 Muscles of Forearm (Intermediate Layer): Anterior View
438 Muscles of Forearm (Deep Layer): Anterior View
439 Attachments of Muscles of Forearm: Anterior View
440 Attachments of Muscles of Forearm: Posterior View
441 Forearm: Serial Cross Sections, Anterior View

Wrist and Hand • Plates 442-461

442 Carpal Bones
443 Movements of Wrist
444 Ligaments of Wrist
445 Ligaments of Wrist (continued)
446 Bones of Wrist and Hand

447 Wrist and Hand: Radiographs
448 Metacarpophalangeal and Interphalangeal Ligaments
449 Wrist and Hand: Superficial Palmar Dissections
450 Wrist and Hand: Deeper Palmar Dissections
451 Lumbrical Muscles and Bursae, Spaces, and Sheaths: Schema
452 Flexor Tendons, Arteries, and Nerves at Wrist
453 Bursae, Spaces, and Tendon Sheaths of Hand
454 Flexor and Extensor Tendons in Fingers
455 Intrinsic Muscles of Hand
456 Arteries and Nerves of Hand: Palmar Views
457 Wrist and Hand: Superficial Dissection
458 Wrist and Hand: Superficial Dorsal Dissection
459 Nerves and Arteries of Dorsal Hand and Wrist
460 Extensor Tendons at Wrist
461 Fingers

Neurovasculature • Plates 462-469

462 Cutaneous Innervation of Wrist and Hand
463 Arteries and Nerves of Upper Limb: Anterior View
464 Nerves of Upper Limb
465 Musculocutaneous Nerve: Anterior View
466 Median Nerve
467 Ulnar Nerve
468 Radial Nerve in Arm and Nerves of Posterior Shoulder: Posterior View
469 Radial Nerve in Forearm and Hand

Regional Imaging • Plate 470

470 Shoulder MRI and CT Scan

Structures with High Clinical Significance • Tables 7.1-7.2

Muscle Tables • Tables 7.3-7.6

Electronic Bonus Plates • Plates BP99-BP106

BP99 Veins of Upper Limb
BP100 Arteries of Arm and Proximal Forearm
BP101 Arteries of Forearm and Hand
BP102 Ligaments of Wrist
BP103 Flexor and Extensor Zones of Hand
BP104 Section Through Metacarpal and Distal Carpal Bones
BP105 Cross Section of Hand: Axial View
BP106 Cross Section of Hand: Axial View (continued)

SECTION 8 LOWER LIMB • Plates 471-535

Surface Anatomy • Plate 471

471 Lower Limb: Surface Anatomy

Cutaneous Anatomy • Plates 472-475

472 Dermatomes of Lower Limb and Segmental Nerve Function
473 Superficial Nerves and Veins of Lower Limb: Anterior View
474 Superficial Nerves and Veins of Lower Limb: Posterior View
475 Lymph Vessels and Nodes of Lower Limb

Hip and Thigh • Plates 476-496

476 Coxal Bone
477 Hip Joint
478 Hip Joint: Anteroposterior Radiograph
479 Femur
480 Bony Attachments of Muscles of Hip and Thigh: Anterior View
481 Bony Attachments of Muscles of Hip and Thigh: Posterior View
482 Muscles of Thigh: Anterior Views
483 Muscles of Thigh: Anterior Views (continued)
484 Muscles of Hip and Thigh: Lateral View
485 Muscles of Hip and Thigh: Posterior Views
486 Psoas and Iliacus Muscles
487 Lumbosacral and Coccygeal Plexuses
488 Lumbar Plexus
489 Sacral and Coccygeal Plexuses
490 Arteries and Nerves of Thigh: Anterior Views
491 Arteries and Nerves of Thigh: Anterior Views (continued)
492 Arteries and Nerves of Thigh: Posterior View
493 Nerves of Hip and Buttock
494 Hip Bursae: Posterior and Anterolateral Views
495 Arteries of Femoral Head and Neck
496 Thigh: Serial Cross Sections

Knee • Plates 497-503

497 Knee: Medial and Lateral Views
498 Knee: Anterior Views
499 Knee: Interior Views
500 Knee: Cruciate and Collateral Ligaments
501 Knee: Anteroposterior Radiograph and Posterior View
502 Knee: Posterior and Sagittal Views
503 Arteries of Lower Limb: Schema

Leg • Plates 504-514

504 Tibia and Fibula
505 Tibia and Fibula (continued)
506 Attachments of Muscles of Leg
507 Muscles of Leg (Superficial Dissection): Posterior View
508 Muscles of Leg (Intermediate Dissection): Posterior View
509 Muscles of Leg (Deep Dissection): Posterior View
510 Muscles of Leg: Lateral View
511 Muscles of Leg (Superficial Dissection): Anterior View
512 Muscles of Leg (Deep Dissection): Anterior View
513 Venous Drainage of Leg
514 Leg: Cross Sections and Fascial Compartments

Ankle and Foot • Plates 515-528

515 Bones of Foot
516 Bones of Foot (continued)
517 Calcaneus
518 Ligaments and Tendons of Ankle
519 Ligaments and Tendons of Foot: Plantar View
520 Tendon Sheaths of Ankle
521 Muscles of Dorsum of Foot: Superficial Dissection
522 Dorsum of Foot: Deep Dissection
523 Plantar Region of Foot: Superficial Dissection
524 Muscles of Plantar Region of Foot: First Layer
525 Muscles of Plantar Region of Foot: Second Layer
526 Muscles of Plantar Region of Foot: Third Layer
527 Interosseous Muscles and Deep Arteries of Foot
528 Interosseous Muscles of Foot

Neurovasculature • Plates 529-533

529 Femoral Nerve and Lateral Femoral Cutaneous Nerve
530 Obturator Nerve
531 Sciatic Nerve and Posterior Femoral Cutaneous Nerve
532 Tibial Nerve
533 Common Fibular Nerve

Regional Imaging • Plates 534-535

534 Hip MRI and 3D CT
535 Ankle: Radiographs

Structures with High Clinical Significance • Tables 8.1-8.2

Muscle Tables • Tables 8.3-8.6

Electronic Bonus Plates • Plates BP107-BP117

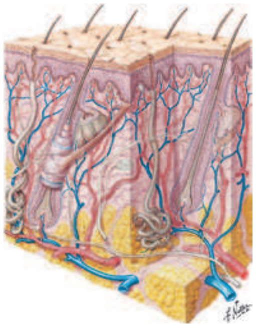
BP107 Veins of Lower Limb
BP108 Arteries of Thigh and Knee
BP109 Cross-Sectional Anatomy of Hip: Axial View
BP110 Arteries of Knee and Foot
BP111 Leg: Serial Cross Sections
BP112 Osteology of Knee
BP113 Knee Radiograph: Lateral View
BP114 Anatomy of Foot: Nerves and Arteries
BP115 Cross-Sectional Anatomy of Ankle and Foot
BP116 Cross-Sectional Anatomy of Ankle and Foot (continued)
BP117 Anatomy of Toenail

INTRODUCTION

1

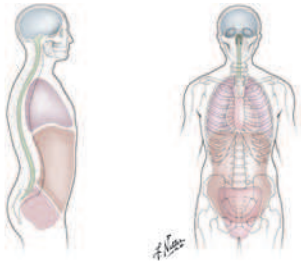
Introduction 1-7

ELECTRONIC BONUS PLATES



BP 1 Cross Section of Skin

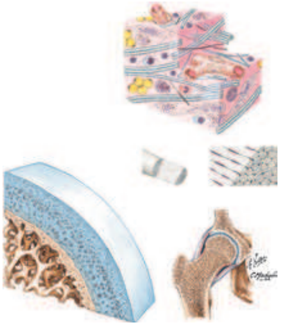
BP 2 Pilosebaceous Unit



BP 3 Major Body Cavities

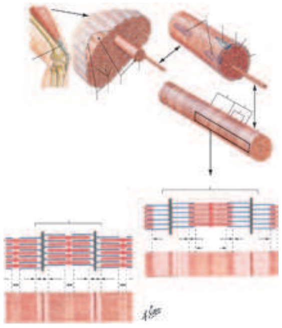
BP 4 Skeletal System: Axial and Appendicular Skeletons

BP 5 Types of Synovial Joints



BP 6 Joints: Connective Tissues and Articular Cartilage

BP 7 Architecture of Bone

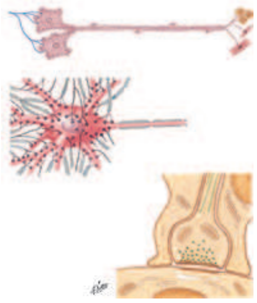


BP 8 Muscular System

ELECTRONIC BONUS PLATES—*cont'd*

BP 9 Overview of the Gastrointestinal System

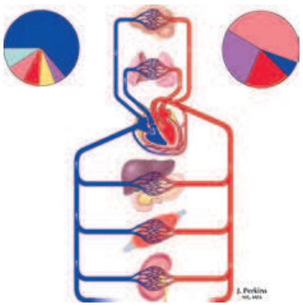
BP 10 Overview of the Endocrine System



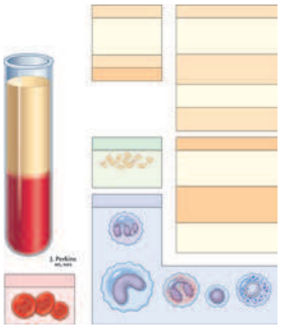
BP 11 Neurons and Synapses

BP 12 Features of a Typical Peripheral Nerve

BP 13 Sites of Visceral Referred Pain

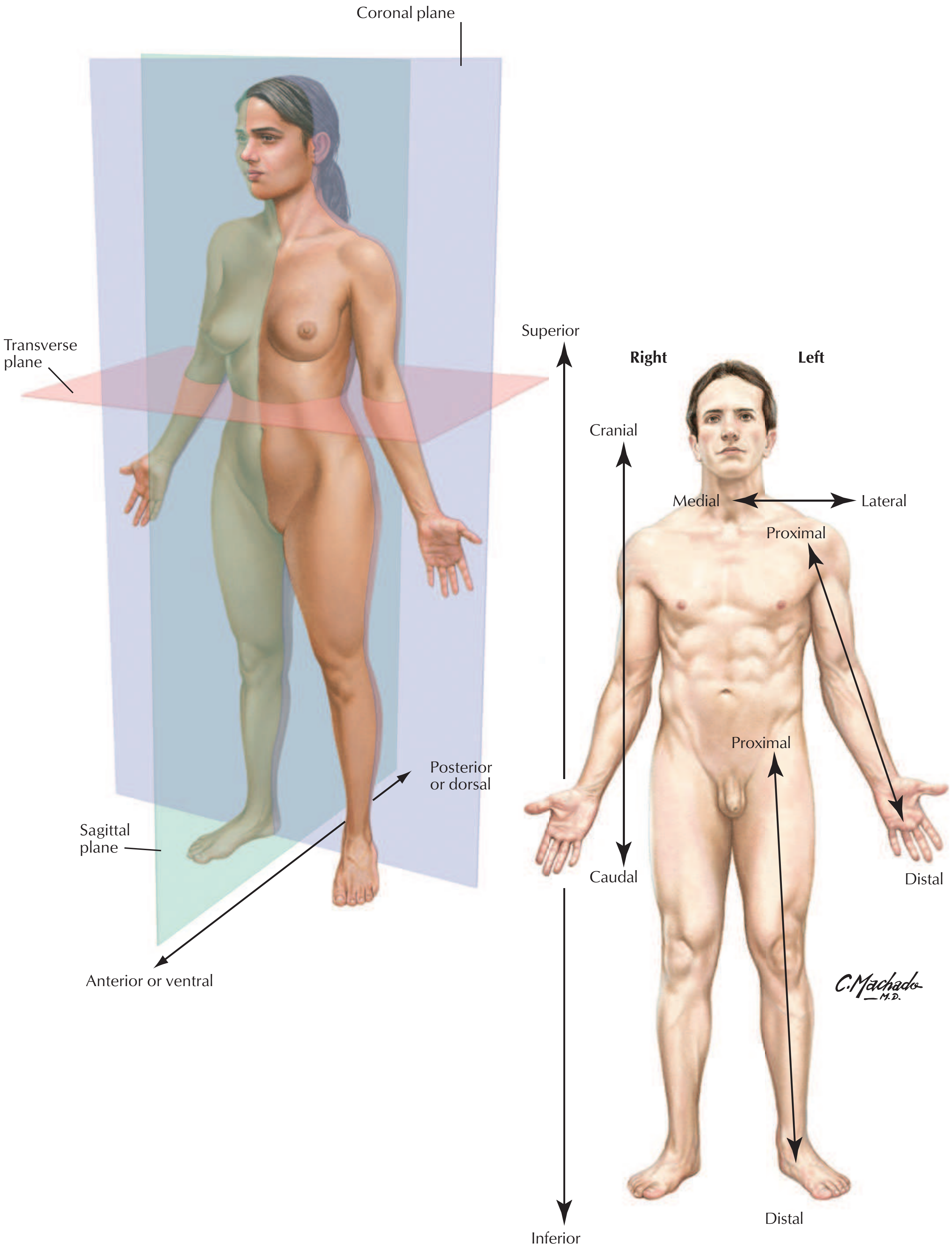


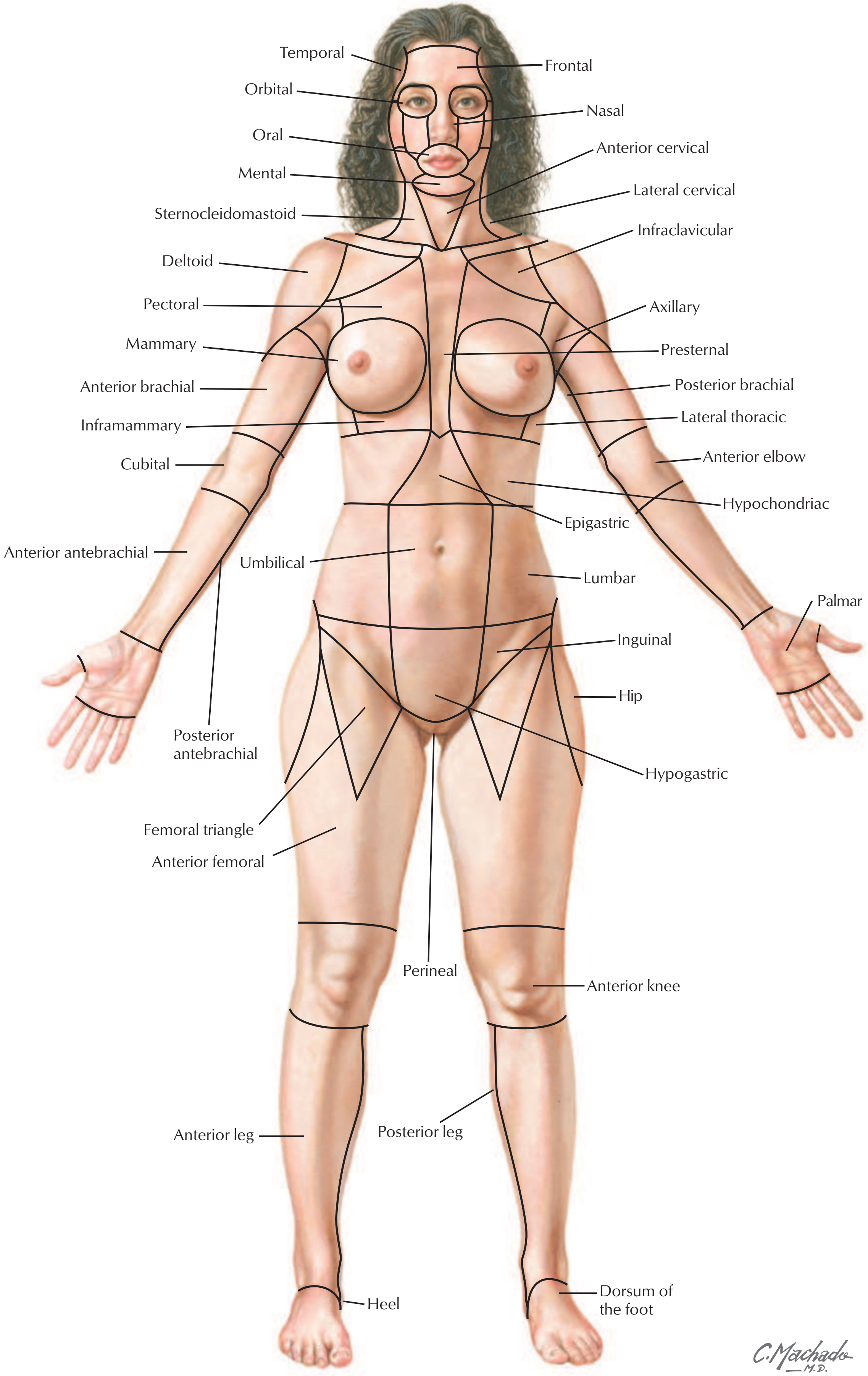
BP 14 General Organization of the Cardiovascular System

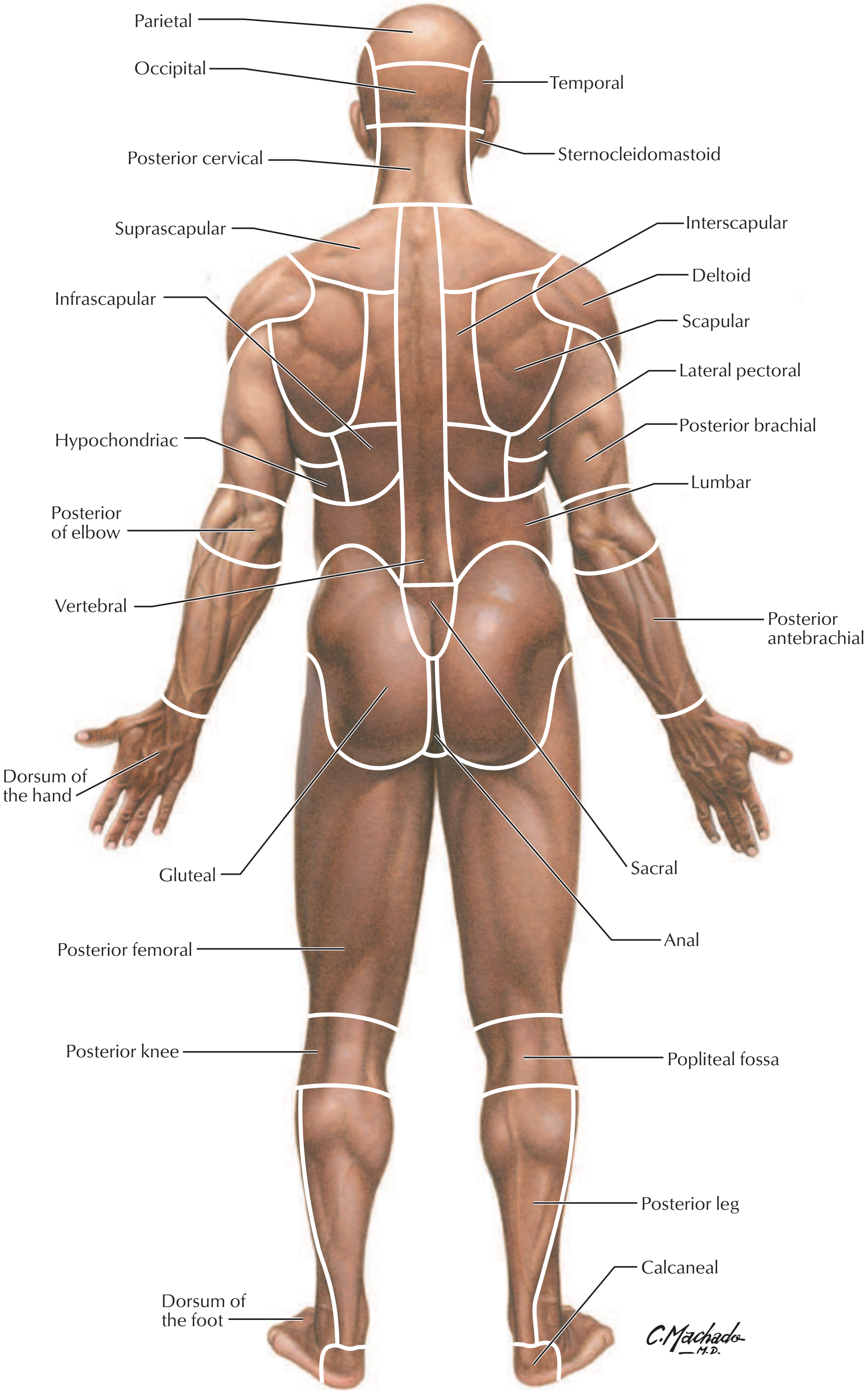


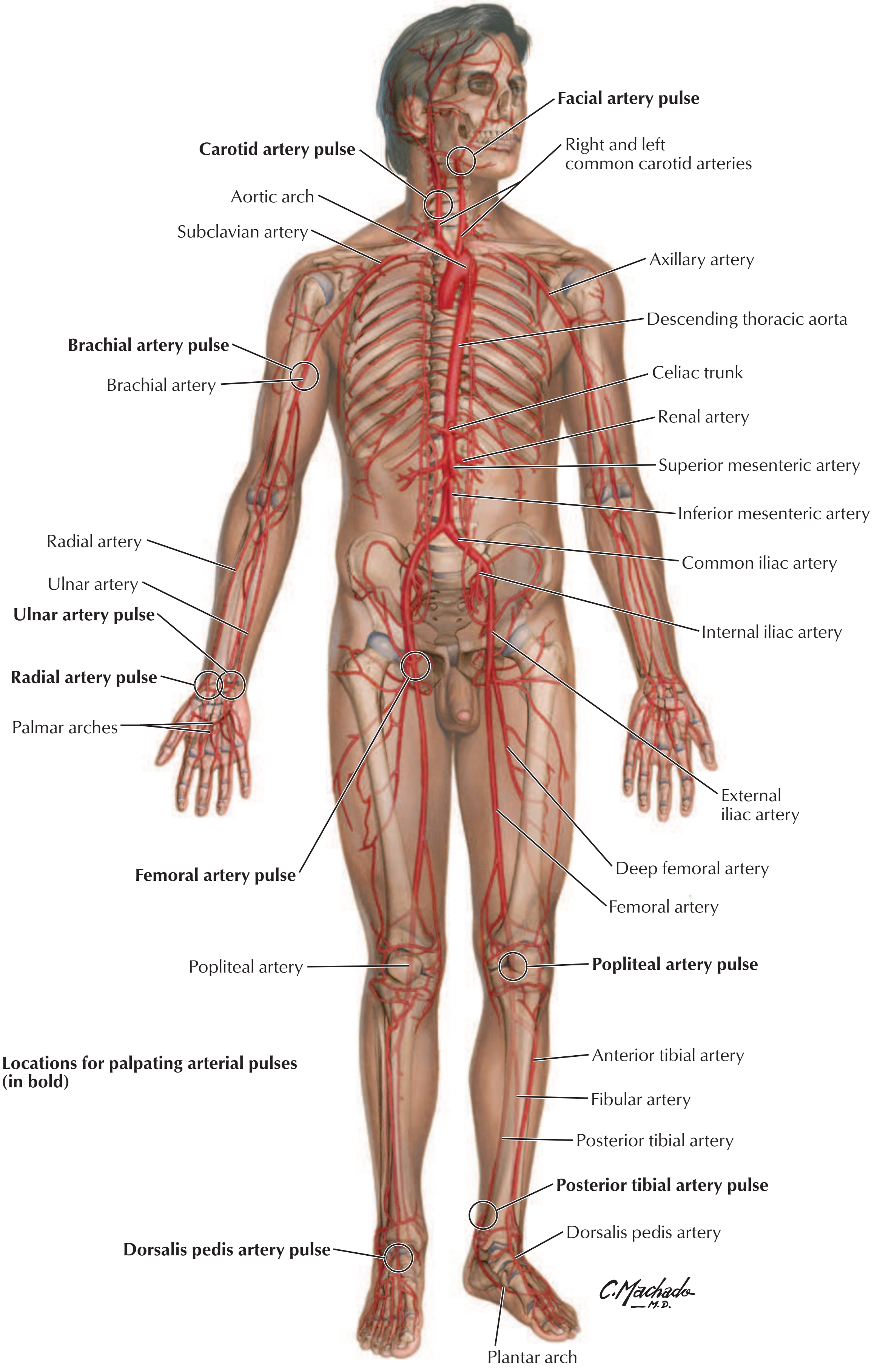
BP 15 Cardiovascular System: Composition of Blood

BP 16 Arterial Wall

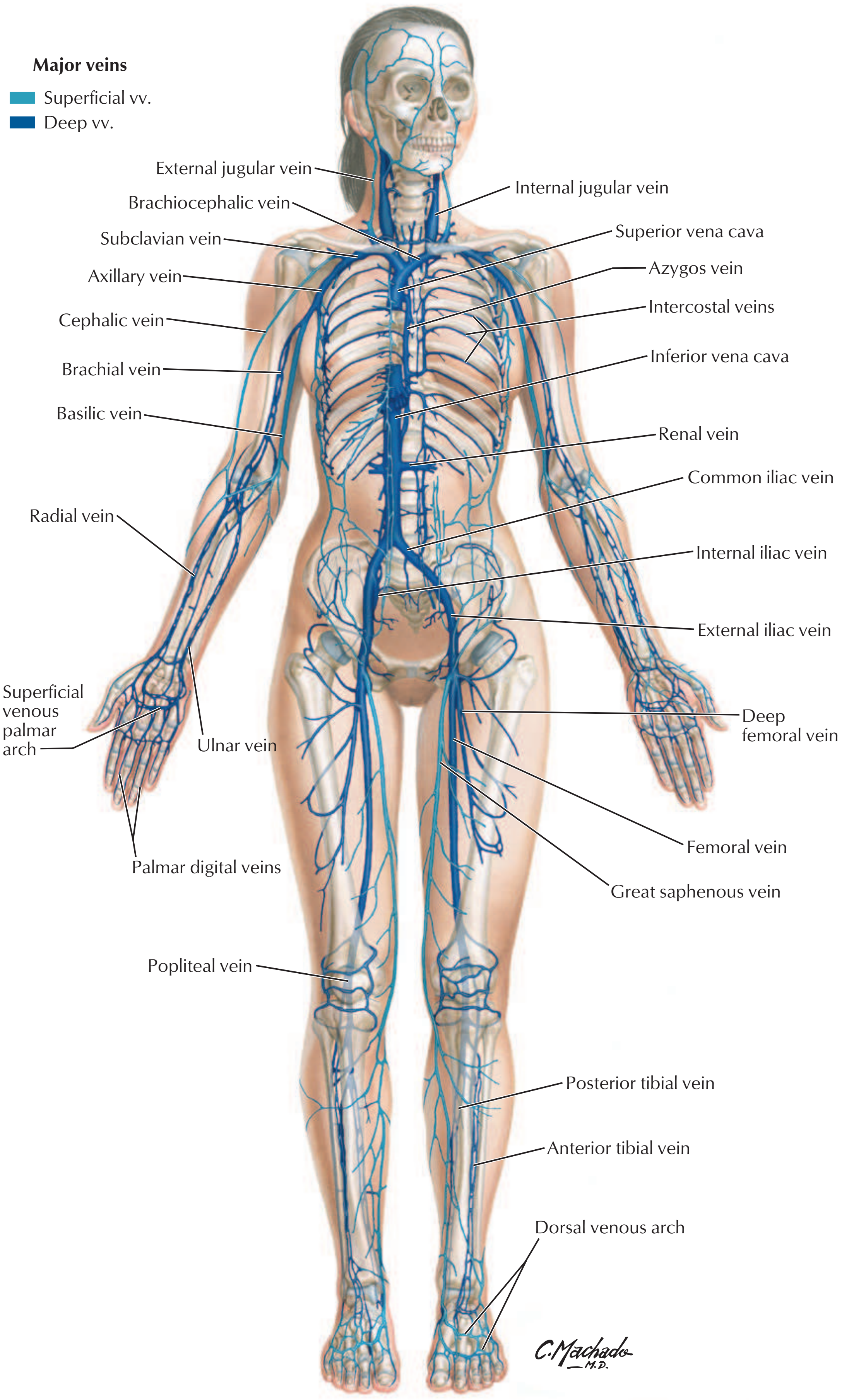

Coronal plane
Transverse plane
Sagittal plane
Posterior or dorsal
Anterior or ventral
Superior
Inferior
Right
Left
Cranial
Caudal
Medial
Lateral
Proximal
Distal
Proximal
Distal
C. Machado M.D.


Temporal
Orbital
Oral
Mental
Sternocleidomastoid
Deltoid
Pectoral
Mammary
Anterior brachial
Inframammary
Cubital
Anterior antebrachial
Umbilical
Posterior antebrachial
Femoral triangle
Anterior femoral
Perineal
Anterior leg
Posterior leg
Heel
Frontal
Nasal
Anterior cervical
Lateral cervical
Infraclavicular
Axillary
Presternal
Posterior brachial
Lateral thoracic
Anterior elbow
Hypochondriac
Epigastric
Lumbar
Palmar
Inguinal
Hip
Hypogastric
Anterior knee
Dorsum of the foot
C. Machado M.D.

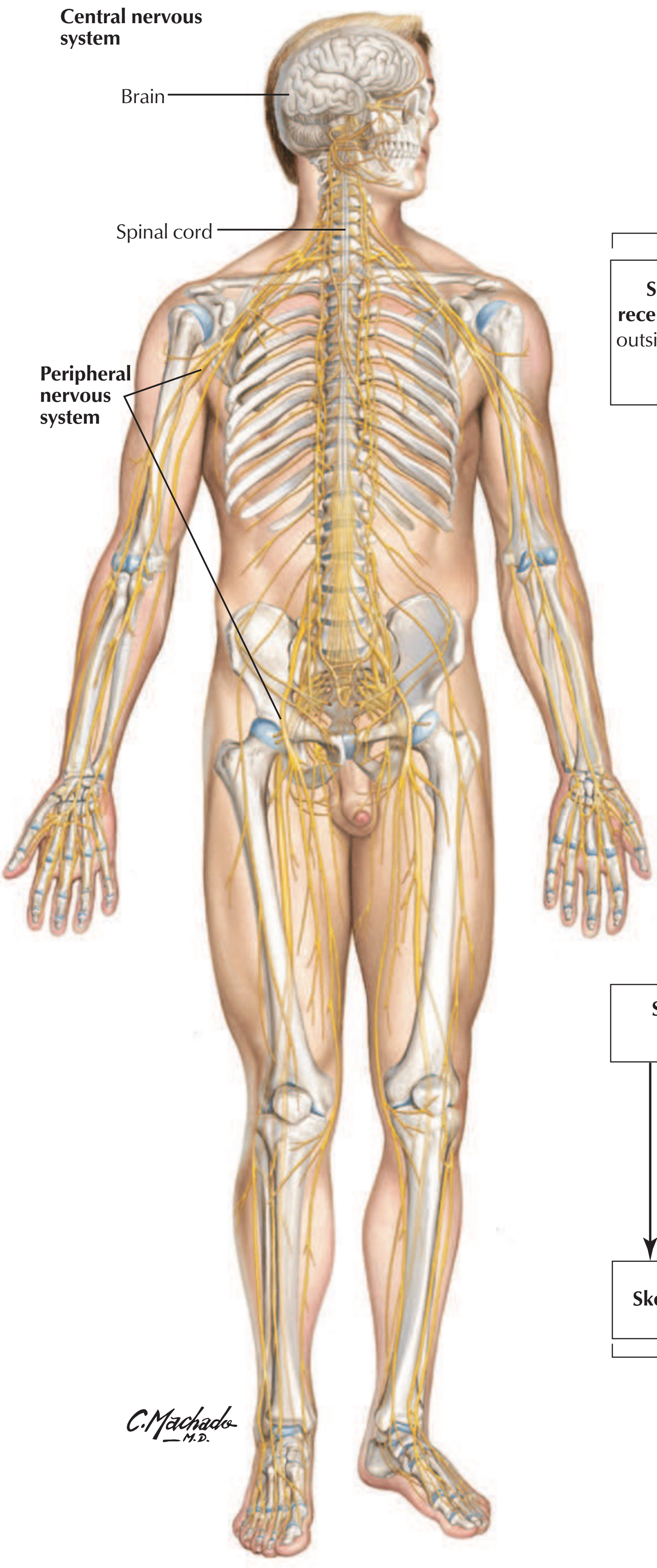

Parietal
Occipital
Temporal
Posterior cervical
Sternocleidomastoid
Suprascapular
Interscapular
Deltoid
Infrascapular
Scapular
Lateral pectoral
Hypochondriac
Posterior brachial
Lumbar
Posterior of elbow
Vertebral
Posterior antebrachial
Dorsum of the hand
Gluteal
Sacral
Anal
Posterior femoral
Posterior knee
Popliteal fossa
Posterior leg
Calcaneal
Dorsum of the foot
C. Machado M.D.

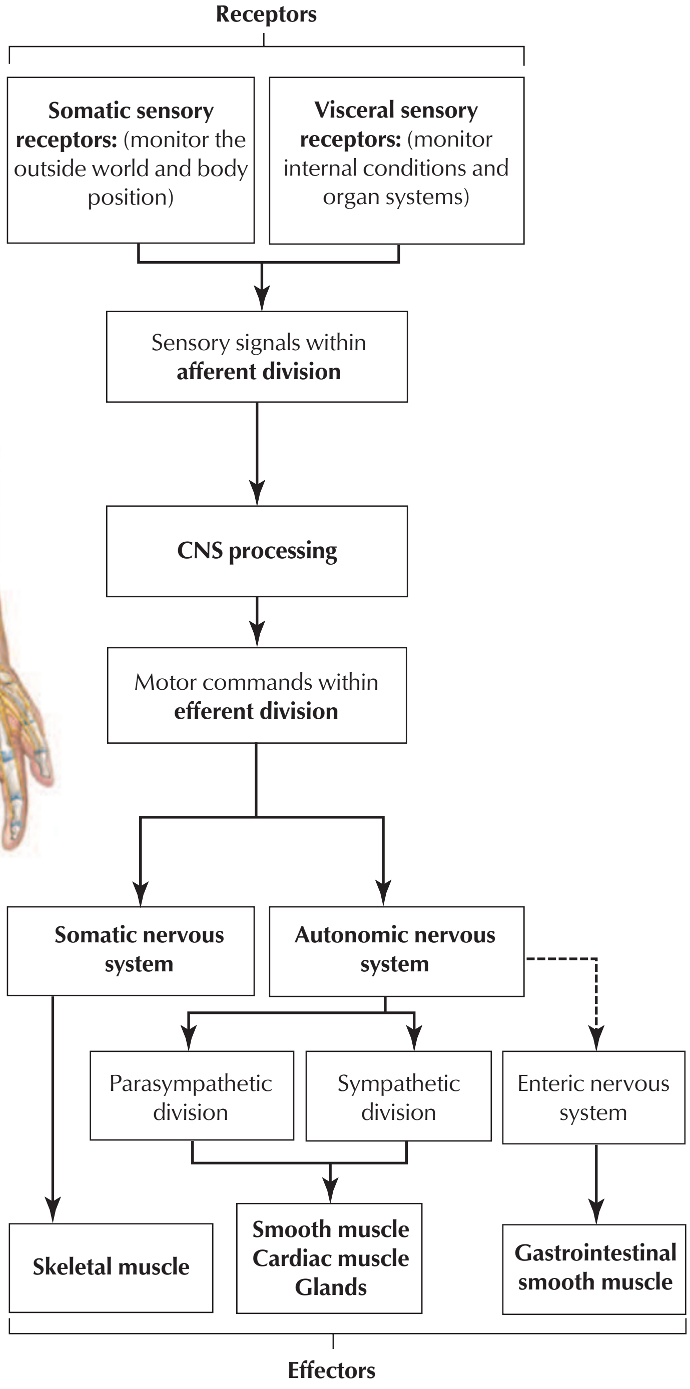

Facial artery pulse
Carotid artery pulse
Right and left common carotid arteries
Aortic arch
Subclavian artery
Axillary artery
Descending thoracic aorta
Brachial artery pulse
Brachial artery
Celiac trunk
Renal artery
Superior mesenteric artery
Inferior mesenteric artery
Radial artery
Common iliac artery
Ulnar artery
Ulnar artery pulse
Internal iliac artery
Radial artery pulse
Palmar arches
External iliac artery
Deep femoral artery
Femoral artery pulse
Femoral artery
Popliteal artery
Popliteal artery pulse
Anterior tibial artery
Fibular artery
Posterior tibial artery
Posterior tibial artery pulse
Dorsalis pedis artery pulse
Dorsalis pedis artery
C. Machado M.D.
Plantar arch

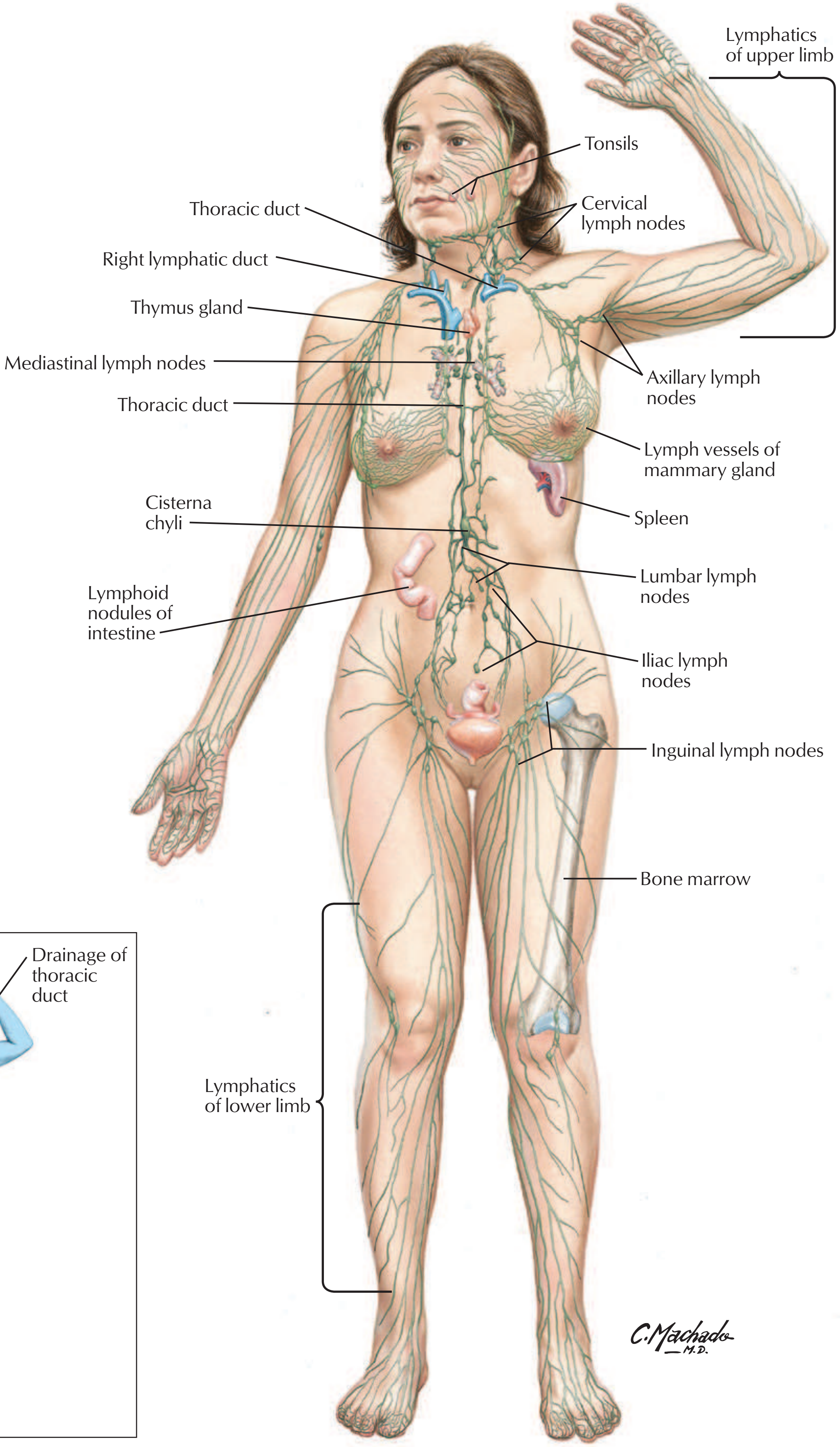
Locations for palpating arterial pulses (in bold)

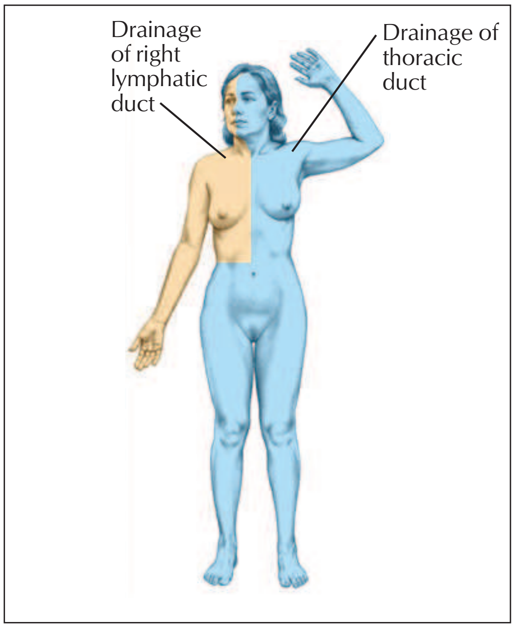

Major veins
▬ Superficial vv.
▬ Deep vv.
External jugular vein
Internal jugular vein
Brachiocephalic vein
Superior vena cava
Subclavian vein
Azygos vein
Axillary vein
Intercostal veins
Cephalic vein
Inferior vena cava
Brachial vein
Basilic vein
Renal vein
Common iliac vein
Radial vein
Internal iliac vein
External iliac vein
Superficial venous palmar arch
Ulnar vein
Deep femoral vein
Palmar digital veins
Femoral vein
Great saphenous vein
Popliteal vein
Posterior tibial vein
Anterior tibial vein
Dorsal venous arch

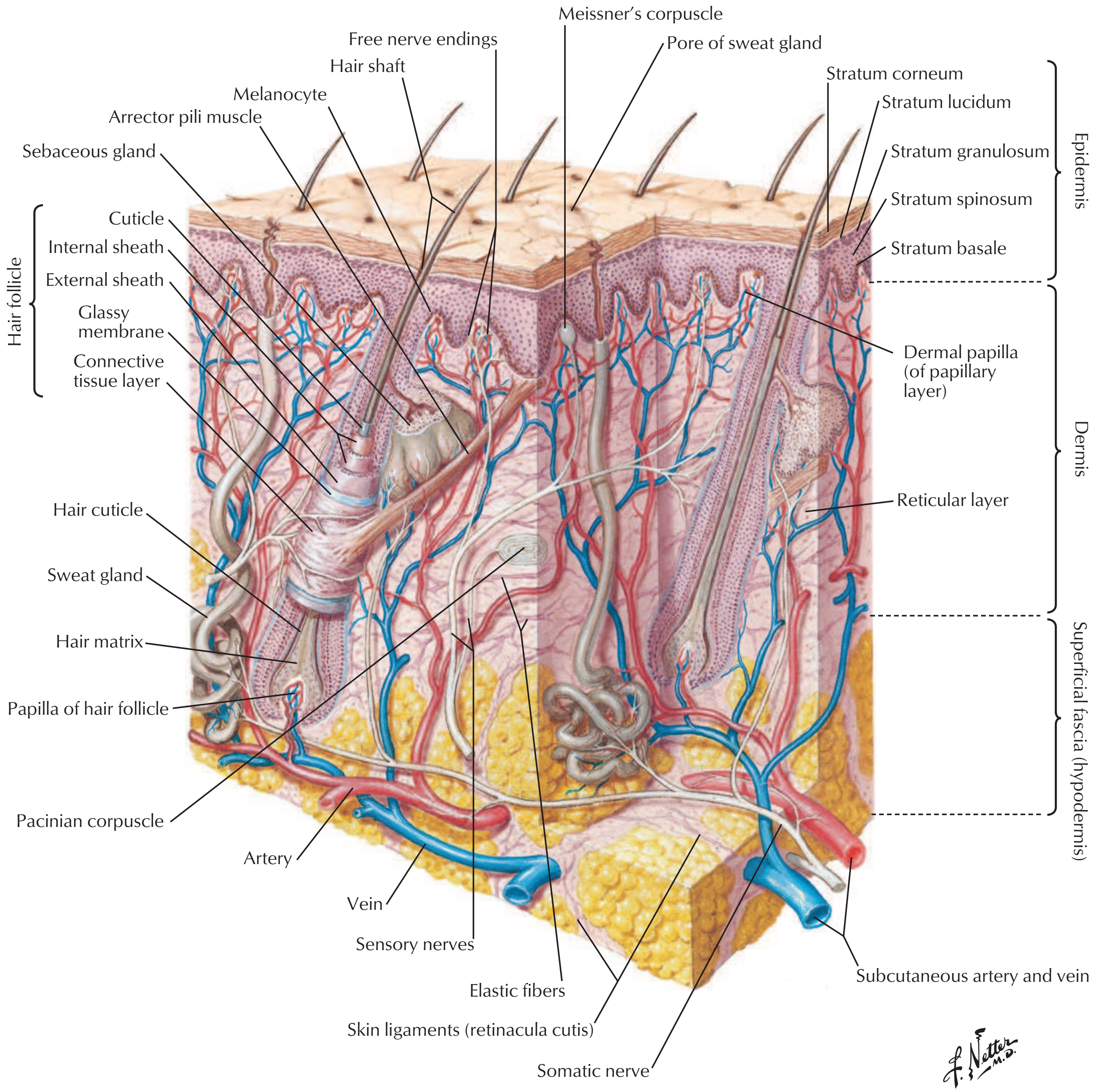
General Organization of the Nervous System

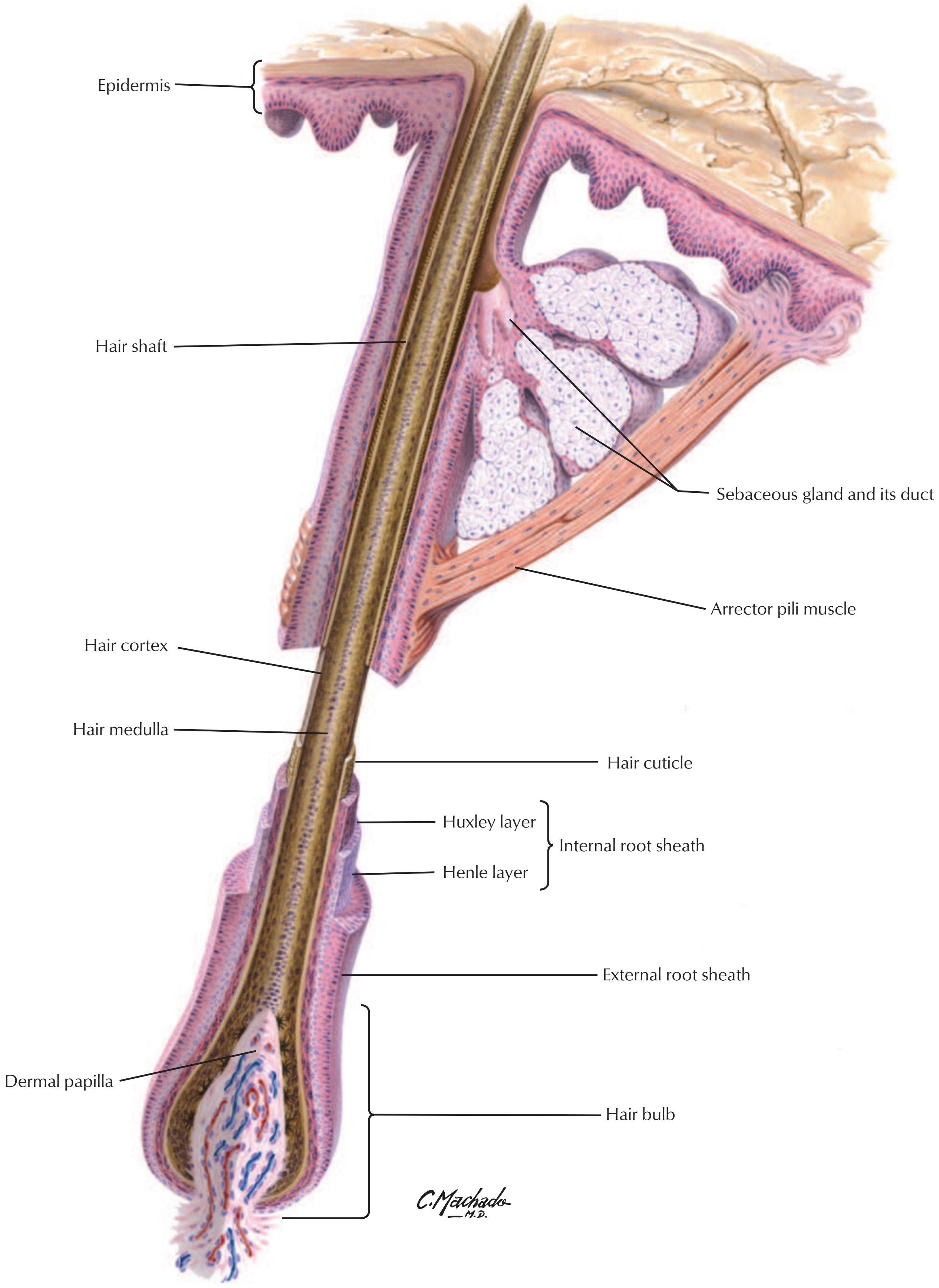

Central nervous system
Brain
Spinal cord
Peripheral nervous system
C.Machado M.D.

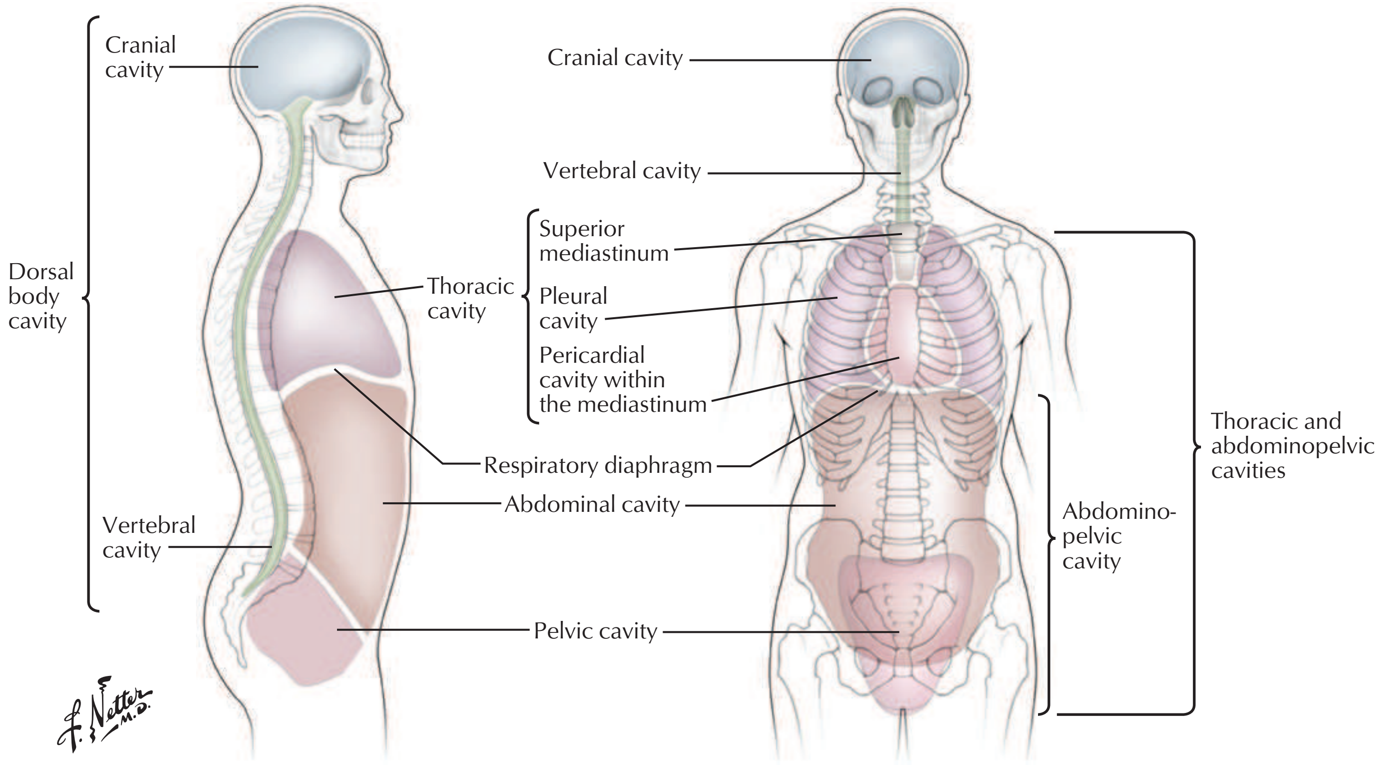

Receptors
Somatic sensory receptors: (monitor the outside world and body position)
Visceral sensory receptors: (monitor internal conditions and organ systems)
Sensory signals within afferent division
CNS processing
Motor commands within efferent division
Somatic nervous system
Autonomic nervous system
Parasympathetic division
Sympathetic division
Enteric nervous system
Skeletal muscle
Smooth muscle Cardiac muscle Glands
Gastrointestinal smooth muscle
Effectors


Lymphatics of upper limb
Tonsils
Thoracic duct
Cervical lymph nodes
Right lymphatic duct
Thymus gland
Mediastinal lymph nodes
Axillary lymph nodes
Thoracic duct
Lymph vessels of mammary gland
Spleen
Cisterna chyli
Lumbar lymph nodes
Lymphoid nodules of intestine
Iliac lymph nodes
Inguinal lymph nodes
Bone marrow
Lymphatics of lower limb
C. Machado M.D.

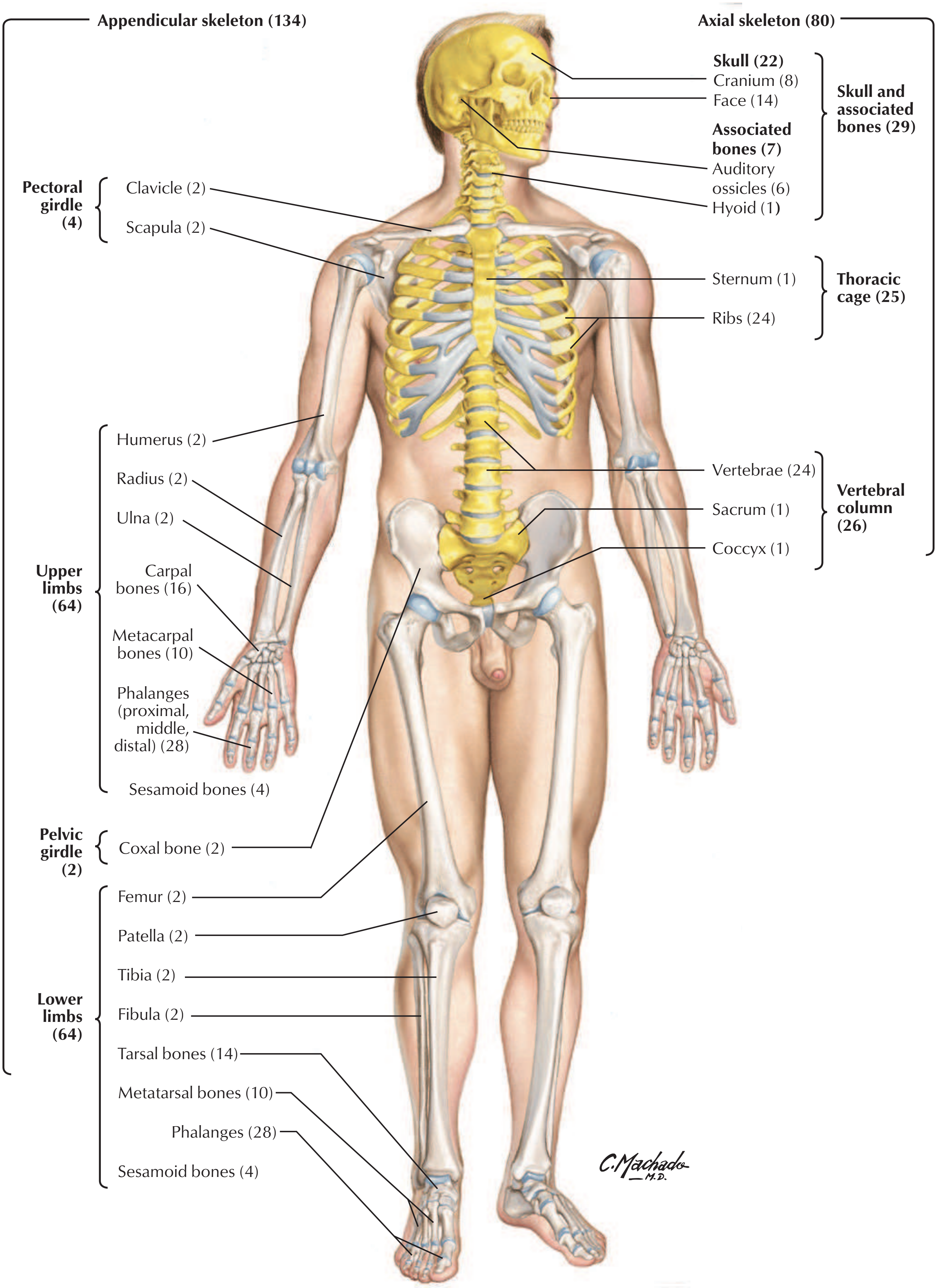

Drainage of right lymphatic duct
Drainage of thoracic duct


Meissner's corpuscle
Free nerve endings
Pore of sweat gland
Hair shaft
Stratum corneum
Melanocyte
Stratum lucidum
Arrector pili muscle
Sebaceous gland
Stratum granulosum
Epidermis
Stratum spinosum
Cuticle
Internal sheath
Stratum basale
External sheath
Hair follicle
Glassy membrane
Dermal papilla (of papillary layer)
Connective tissue layer
Dermis
Reticular layer
Hair cuticle
Sweat gland
Hair matrix
Superficial fascia (hypodermis)
Papilla of hair follicle
Pacinian corpuscle
Artery
Vein
Sensory nerves
Subcutaneous artery and vein
Elastic fibers
Skin ligaments (retinacula cutis)
Somatic nerve
F. Netter M.D.

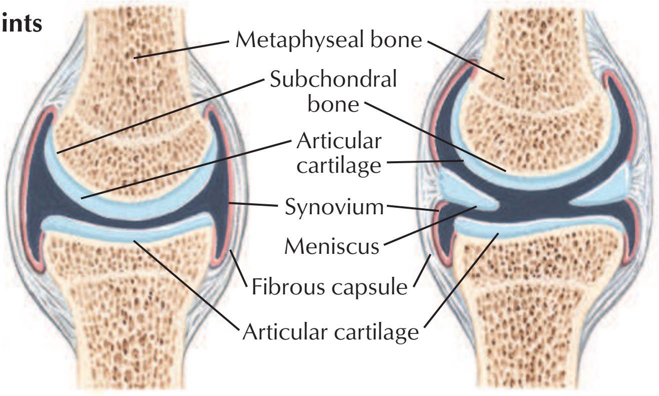

Epidermis
Hair shaft
Sebaceous gland and its duct
Arrector pili muscle
Hair cortex
Hair medulla
Hair cuticle
Huxley layer
Henle layer
Internal root sheath
External root sheath
Dermal papilla
Hair bulb
C.Machado M.D.

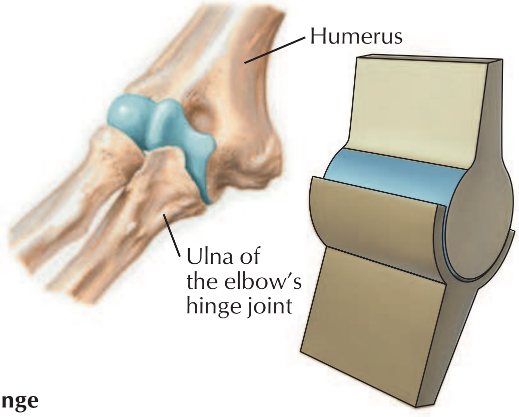

Cranial cavity
Dorsal body cavity
Vertebral cavity
Thoracic cavity
Superior mediastinum
Pleural cavity
Pericardial cavity within the mediastinum
Respiratory diaphragm
Abdominal cavity
Pelvic cavity
Cranial cavity
Vertebral cavity
Abdomino-pelvic cavity
Thoracic and abdominopelvic cavities
F. Netter M.D.

Skeletal System: Axial and Appendicular Skeletons

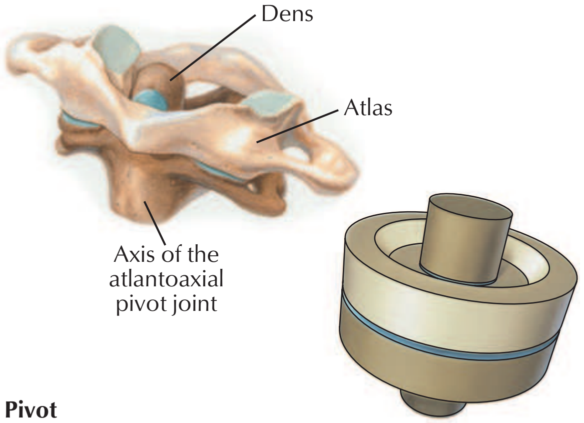

Appendicular skeleton (134)
Axial skeleton (80)
Skull (22)
Cranium (8)
Face (14)
Associated bones (7)
Auditory ossicles (6)
Hyoid (1)
Skull and associated bones (29)
Pectoral girdle (4)
Clavicle (2)
Scapula (2)
Sternum (1)
Ribs (24)
Thoracic cage (25)
Upper limbs (64)
Humerus (2)
Radius (2)
Ulna (2)
Carpal bones (16)
Metacarpal bones (10)
Phalanges (proximal, middle, distal) (28)
Sesamoid bones (4)
Vertebrae (24)
Sacrum (1)
Coccyx (1)
Vertebral column (26)
Pelvic girdle (2)
Coxal bone (2)
Lower limbs (64)
Femur (2)
Patella (2)
Tibia (2)
Fibula (2)
Tarsal bones (14)
Metatarsal bones (10)
Phalanges (28)
Sesamoid bones (4)
C. Machado M.D.

Structure of synovial joints

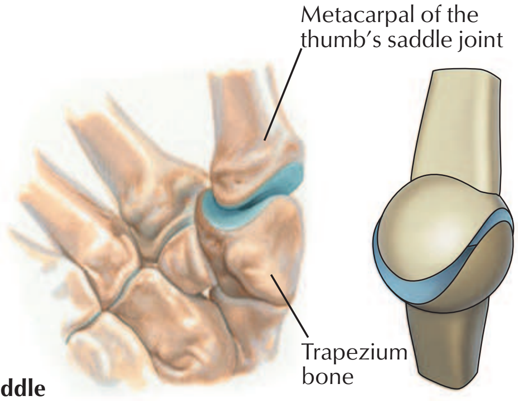

Metaphyseal bone
Subchondral bone
Articular cartilage
Synovium
Meniscus
Fibrous capsule
Articular cartilage


Humerus
Ulna of the elbow's hinge joint

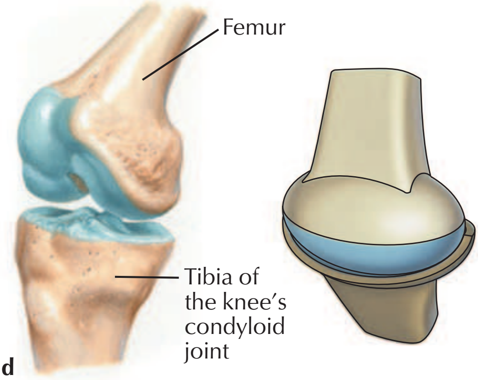
A. Hinge


Dens
Atlas
Axis of the atlantoaxial pivot joint

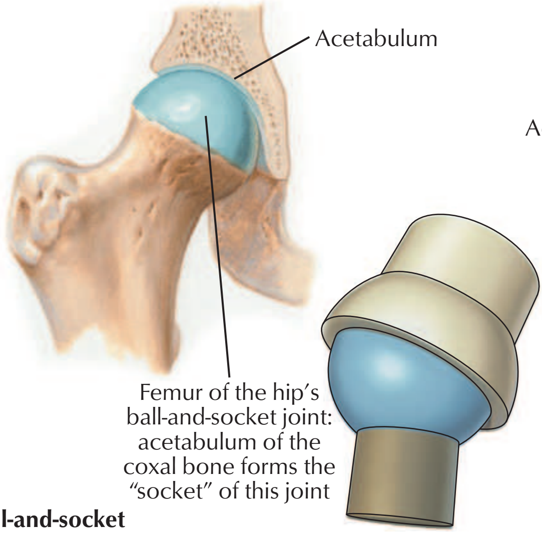
B. Pivot


Metacarpal of the thumb's saddle joint
Trapezium bone

C. Saddle

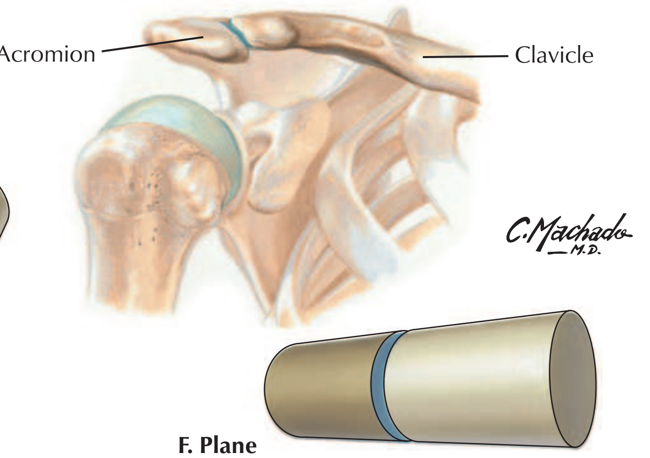

Femur
Tibia of the knee's condyloid joint

D. Condyloid


Acetabulum
Femur of the hip's ball-and-socket joint: acetabulum of the coxal bone forms the "socket" of this joint

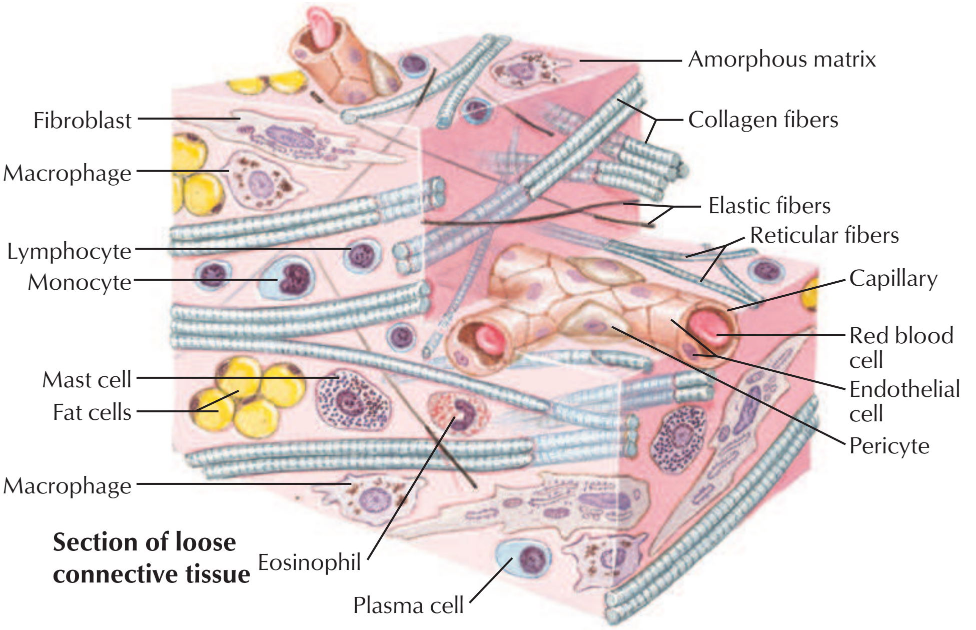
E. Ball-and-socket

Acromioclavicular plane joint at the shoulder: plane joint between the acromion of the scapula and clavicle

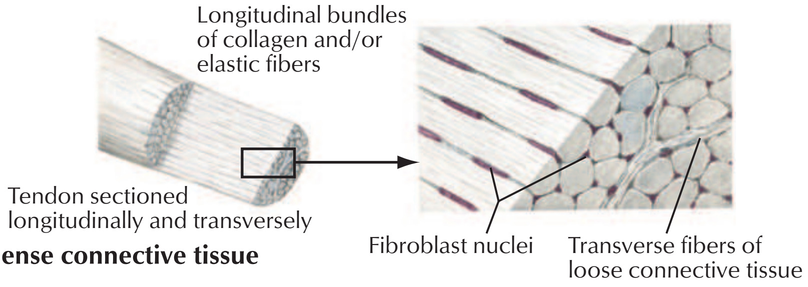

Acromion
Clavicle

F. Plane

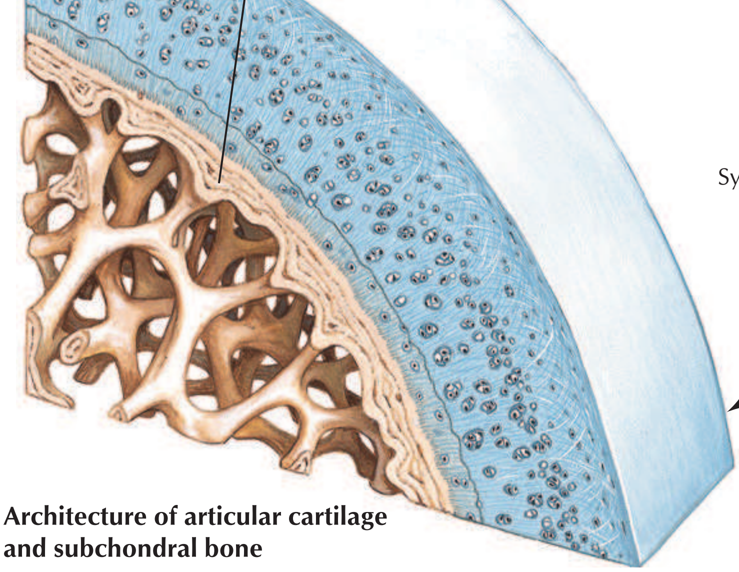
Joints: Connective Tissues and Articular Cartilage


Amorphous matrix
Fibroblast
Collagen fibers
Macrophage
Elastic fibers
Reticular fibers
Lymphocyte
Monocyte
Capillary
Red blood cell
Endothelial cell
Mast cell
Fat cells
Pericyte
Macrophage
Eosinophil
Plasma cell

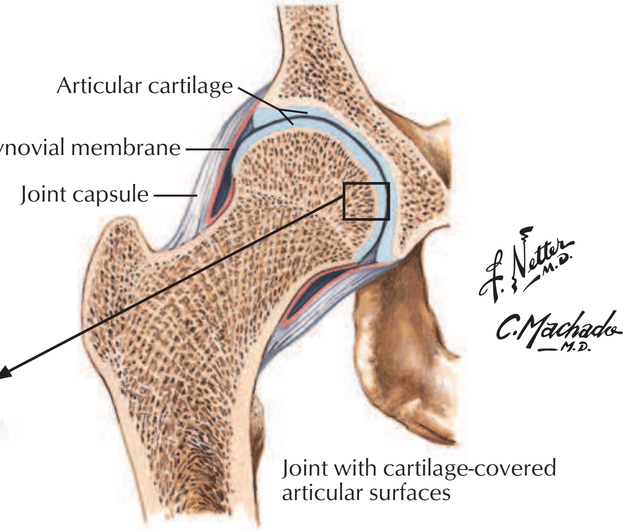
Section of loose connective tissue


Longitudinal bundles of collagen and/or elastic fibers
Tendon sectioned longitudinally and transversely
Fibroblast nuclei
Transverse fibers of loose connective tissue

Dense connective tissue

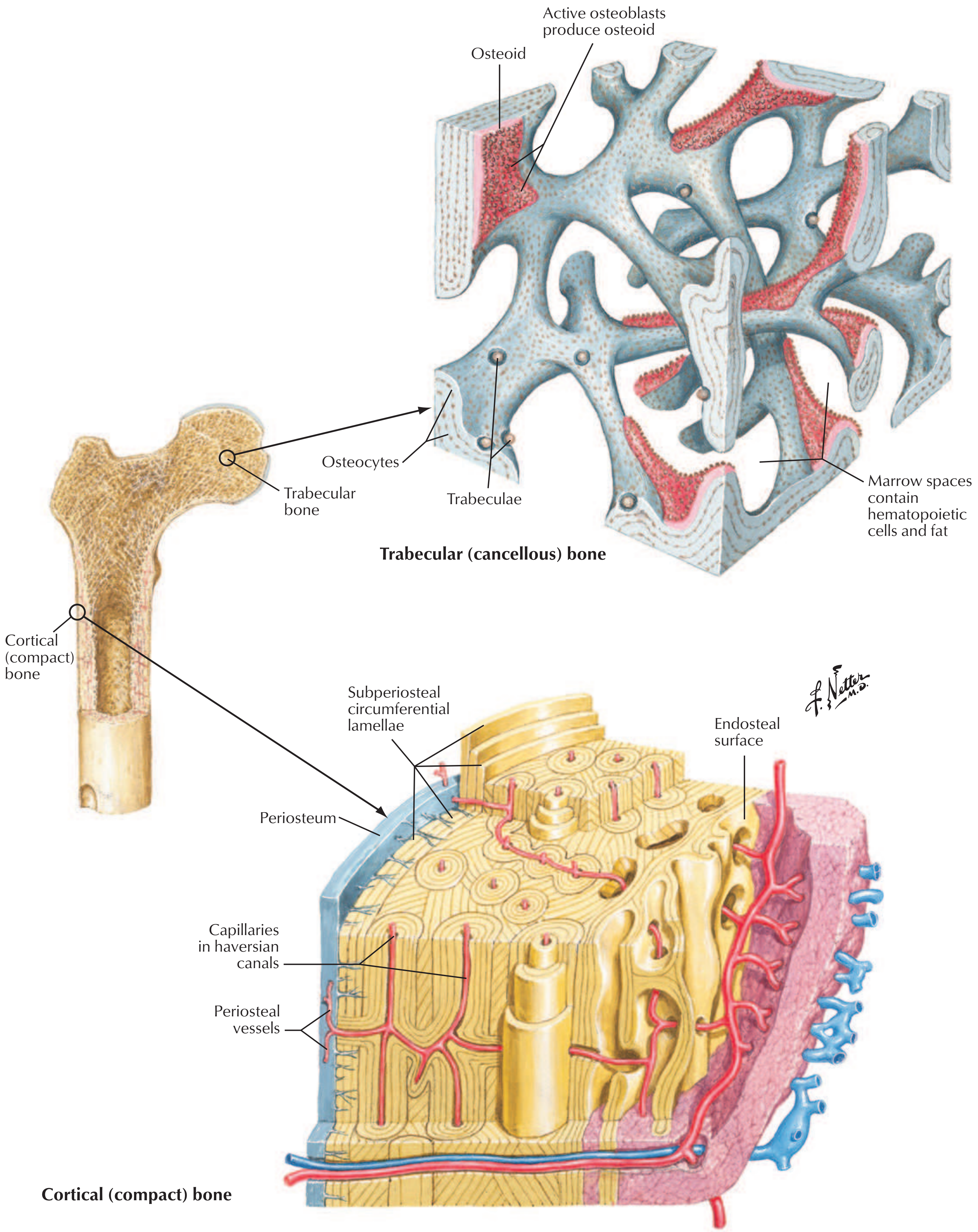

Articular cartilage
Subchondral bone

Architecture of articular cartilage and subchondral bone


Articular cartilage
Synovial membrane
Joint capsule
Joint with cartilage-covered articular surfaces

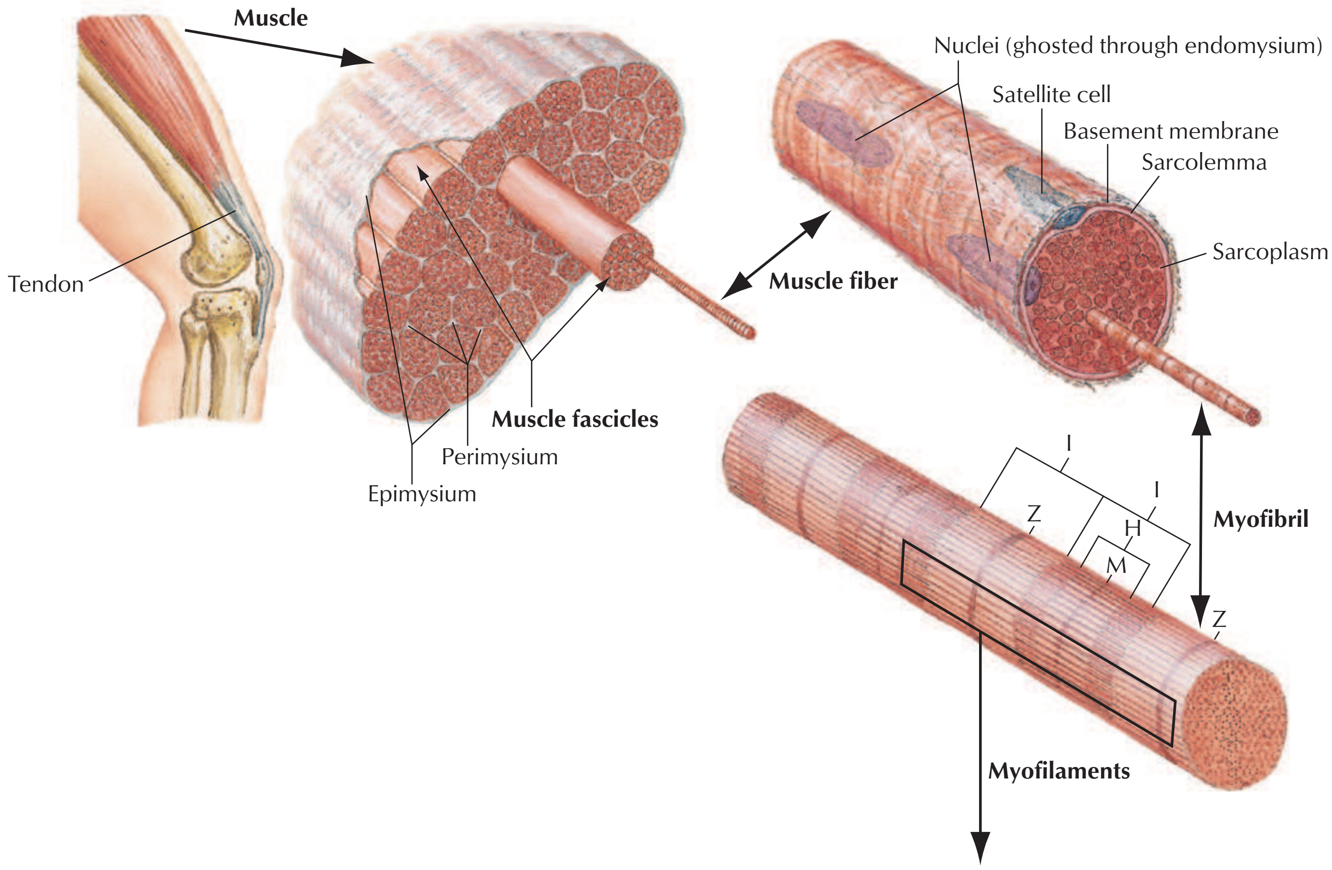
Hip joint and articular surface

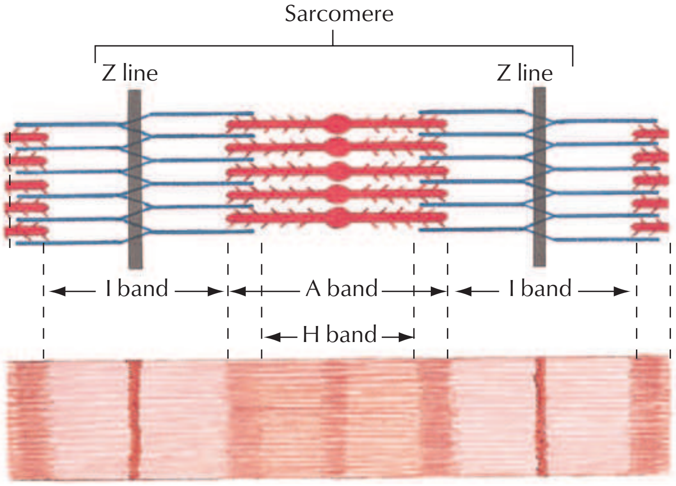
Architecture of Bone


Active osteoblasts produce osteoid
Osteoid
Osteocytes
Trabecular bone
Trabeculae
Marrow spaces contain hematopoietic cells and fat
Cortical (compact) bone
Subperiosteal circumferential lamellae
Endosteal surface
Periosteum
Capillaries in haversian canals
Periosteal vessels
F. Netter M.D.

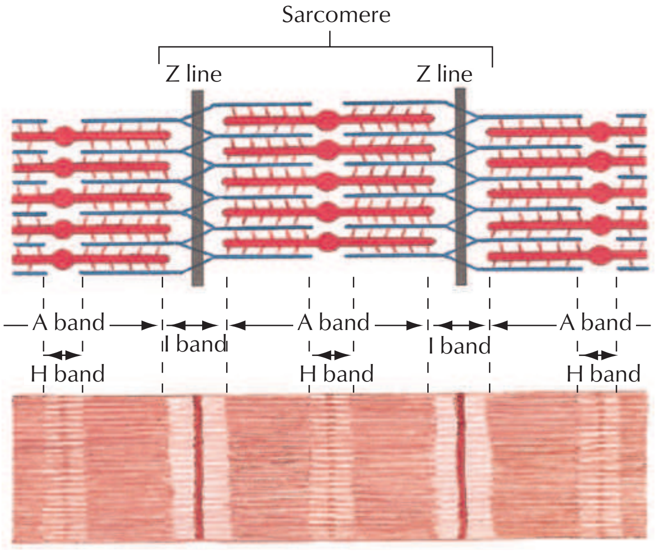
Trabecular (cancellous) bone

Cortical (compact) bone

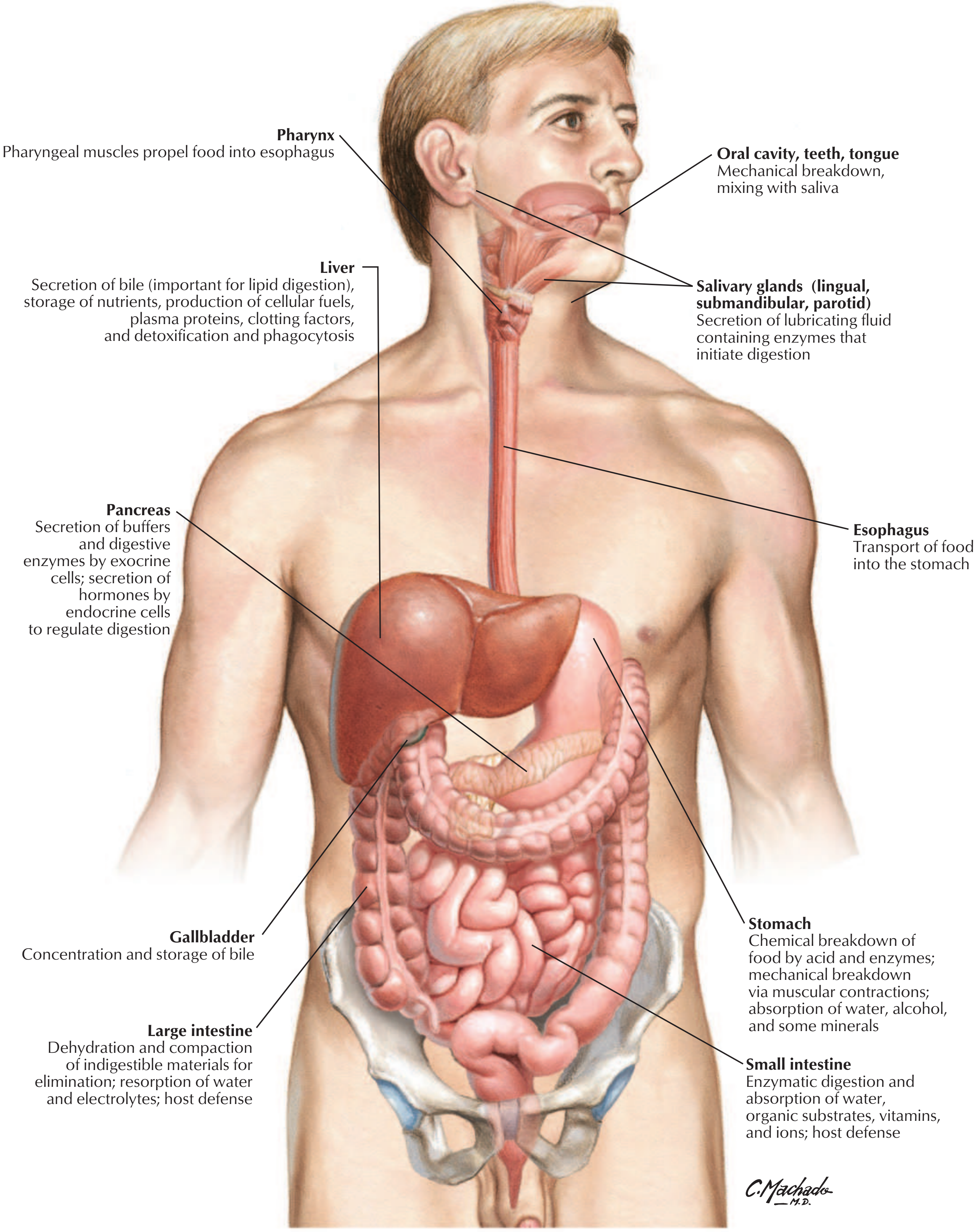

Muscle
Tendon
Muscle fascicles
Perimysium
Epimysium
Muscle fiber
Nuclei (ghosted through endomysium)
Satellite cell
Basement membrane
Sarcolemma
Sarcoplasm
Myofibril
I
I
Z
H
M
Z
Myofilaments


Sarcomere
Z line
Z line
I band
A band
I band
H band

Muscle relaxed


Sarcomere
Z line
Z line
A band
I band
A band
I band
A band
H band
H band
H band

Muscle contracted



Pharynx
Pharyngeal muscles propel food into esophagus

Liver
Secretion of bile (important for lipid digestion), storage of nutrients, production of cellular fuels, plasma proteins, clotting factors, and detoxification and phagocytosis

Pancreas
Secretion of buffers and digestive enzymes by exocrine cells; secretion of hormones by endocrine cells to regulate digestion

Gallbladder
Concentration and storage of bile

Large intestine
Dehydration and compaction of indigestible materials for elimination; resorption of water and electrolytes; host defense

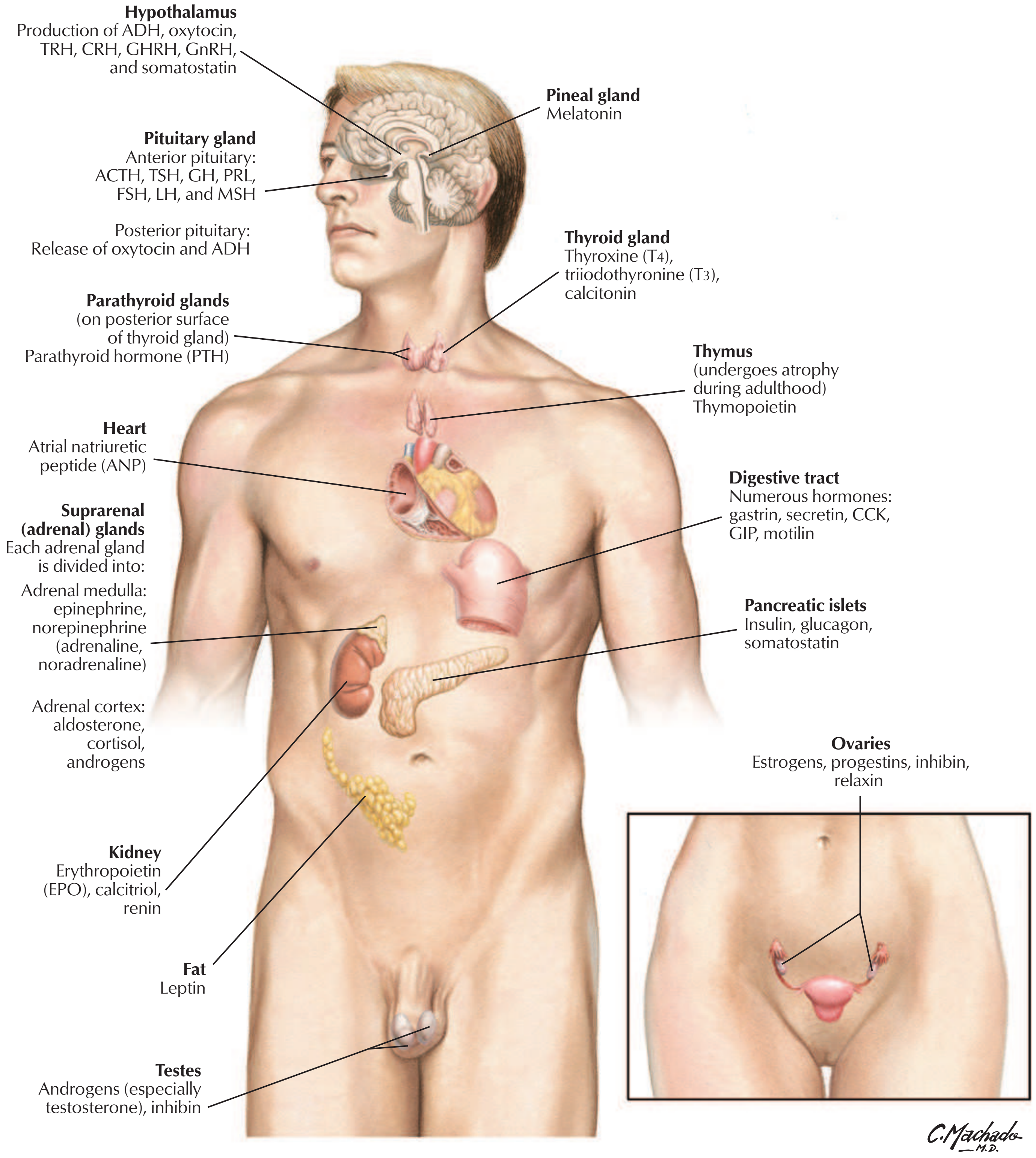
Oral cavity, teeth, tongue
Mechanical breakdown, mixing with saliva

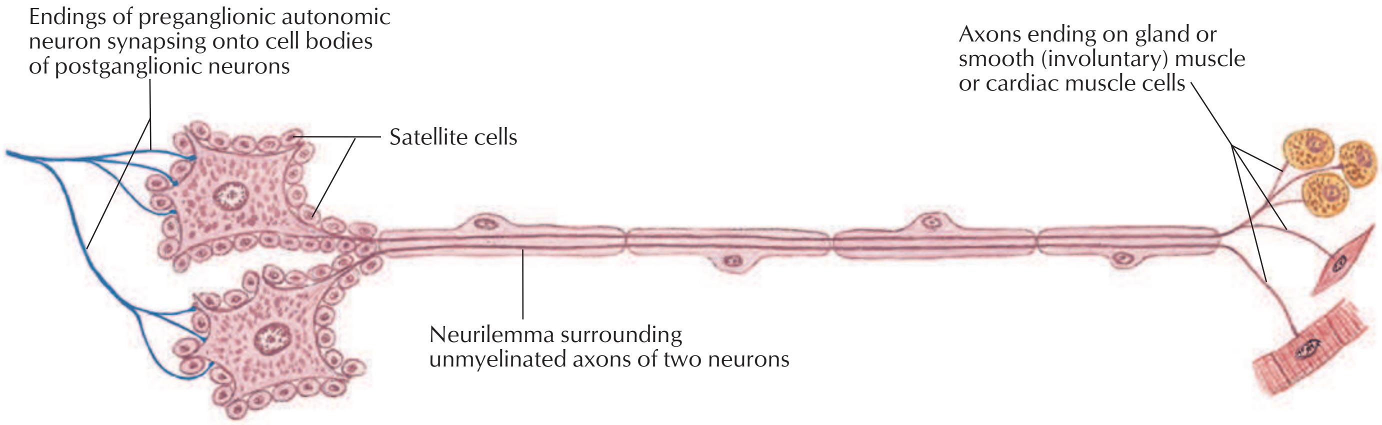
Salivary glands (lingual, submandibular, parotid)
Secretion of lubricating fluid containing enzymes that initiate digestion

Esophagus
Transport of food into the stomach

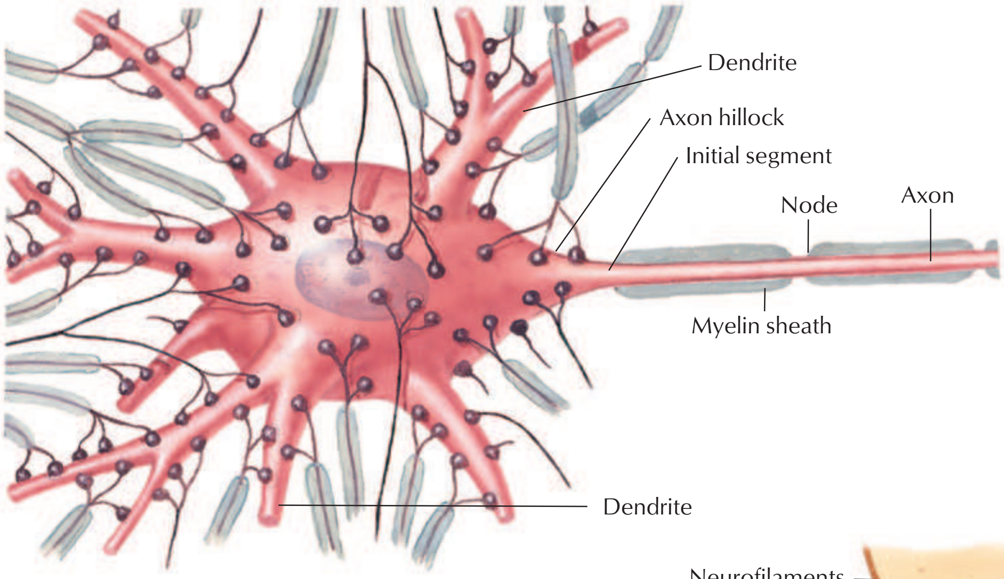
Stomach
Chemical breakdown of food by acid and enzymes; mechanical breakdown via muscular contractions; absorption of water, alcohol, and some minerals

Small intestine
Enzymatic digestion and absorption of water, organic substrates, vitamins, and ions; host defense


Hypothalamus
Production of ADH, oxytocin, TRH, CRH, GHRH, GnRH, and somatostatin
Pituitary gland
Anterior pituitary: ACTH, TSH, GH, PRL, FSH, LH, and MSH
Posterior pituitary: Release of oxytocin and ADH
Parathyroid glands
(on posterior surface of thyroid gland)
Parathyroid hormone (PTH)
Heart
Atrial natriuretic peptide (ANP)
Suprarenal (adrenal) glands
Each adrenal gland is divided into:
Adrenal medulla: epinephrine, norepinephrine (adrenaline, noradrenaline)
Adrenal cortex: aldosterone, cortisol, androgens
Kidney
Erythropoietin (EPO), calcitriol, renin
Fat
Leptin
Testes
Androgens (especially testosterone), inhibin
Pineal gland
Melatonin
Thyroid gland
Thyroxine (T4), triiodothyronine (T3), calcitonin
Thymus
(undergoes atrophy during adulthood)
Thymopoietin
Digestive tract
Numerous hormones: gastrin, secretin, CCK, GIP, motilin
Pancreatic islets
Insulin, glucagon, somatostatin
Ovaries
Estrogens, progestins, inhibin, relaxin
C. Machado M.D.

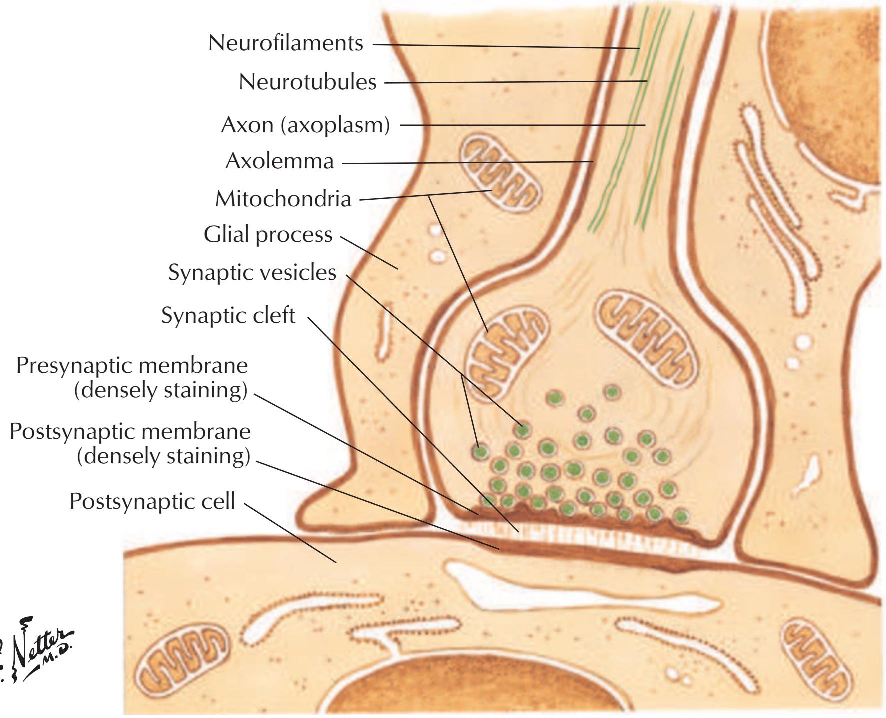

Endings of preganglionic autonomic neuron synapsing onto cell bodies of postganglionic neurons
Satellite cells
Axons ending on gland or smooth (involuntary) muscle or cardiac muscle cells
Neurilemma surrounding unmyelinated axons of two neurons

Two postganglionic autonomic neurons of a sympathetic or parasympathetic ganglion


Dendrite
Axon hillock
Initial segment
Node
Axon
Myelin sheath
Dendrite

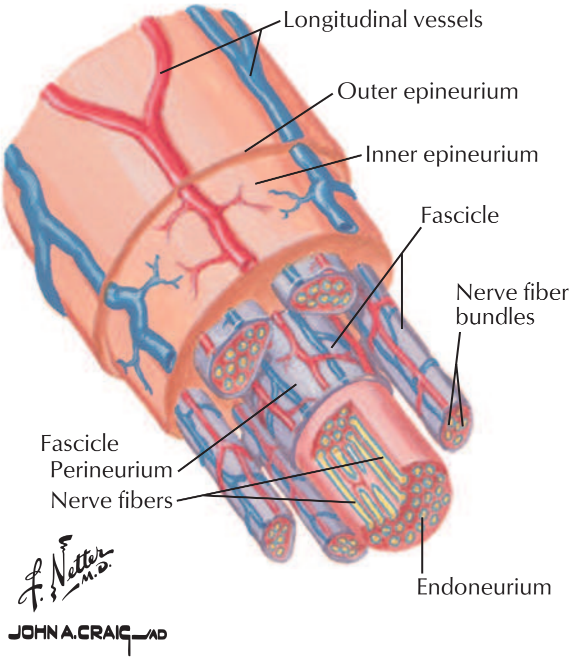
Schematic of synaptic endings

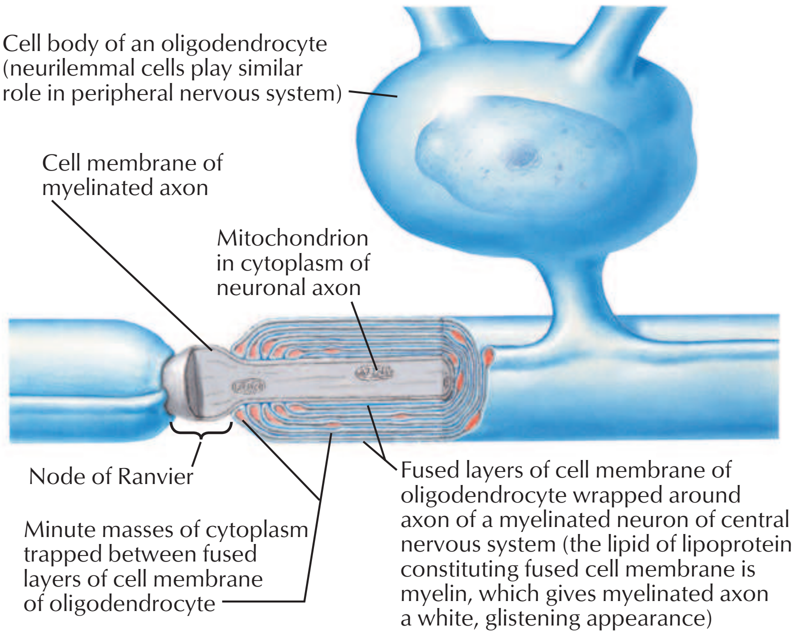
Numerous boutons (synaptic knobs) of presynaptic neurons terminating on a motor neuron and its dendrites

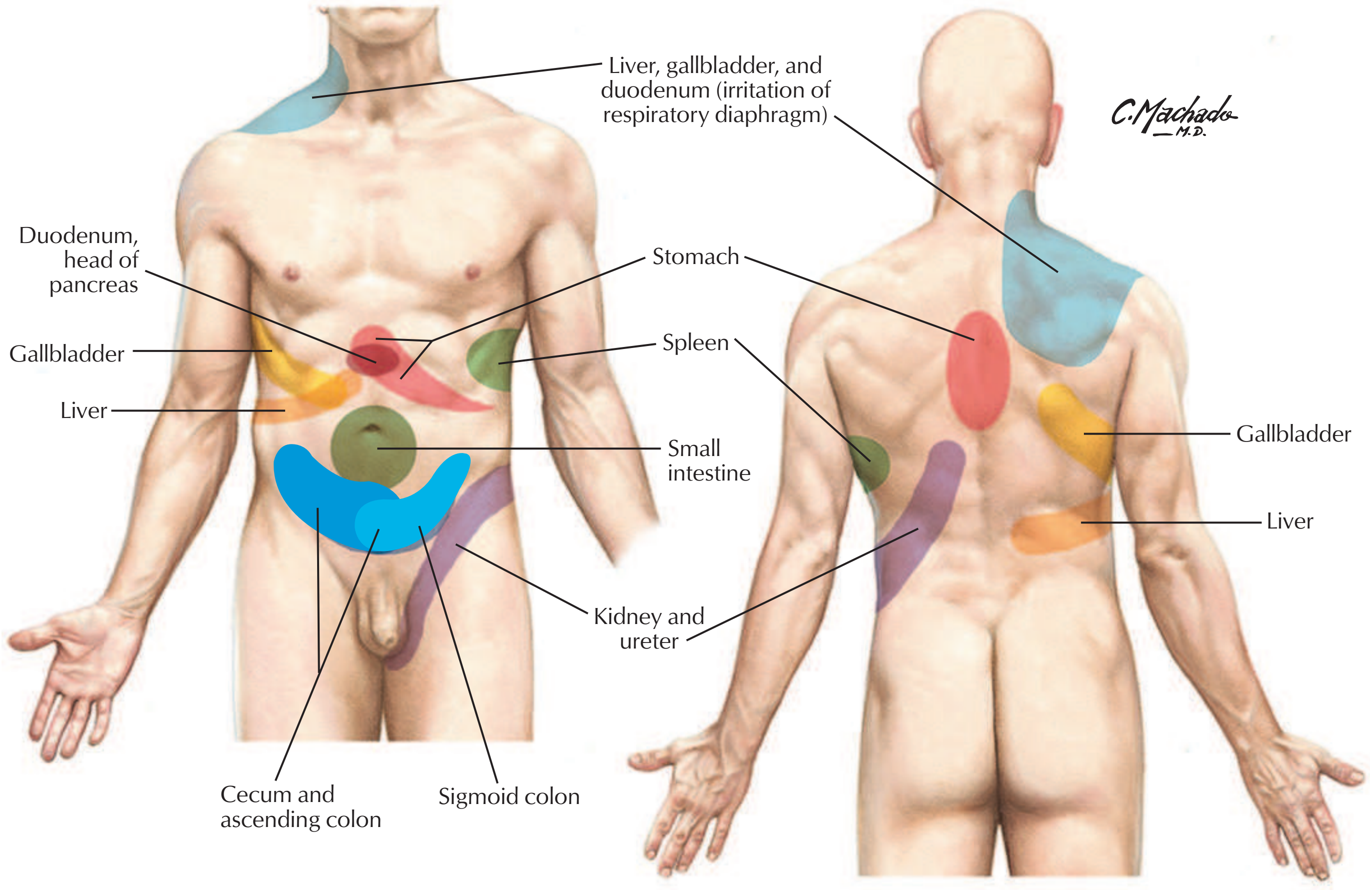

Neurofilaments
Neurotubules
Axon (axoplasm)
Axolemma
Mitochondria
Glial process
Synaptic vesicles
Synaptic cleft
Presynaptic membrane (densely staining)
Postsynaptic membrane (densely staining)
Postsynaptic cell

Enlarged section of bouton

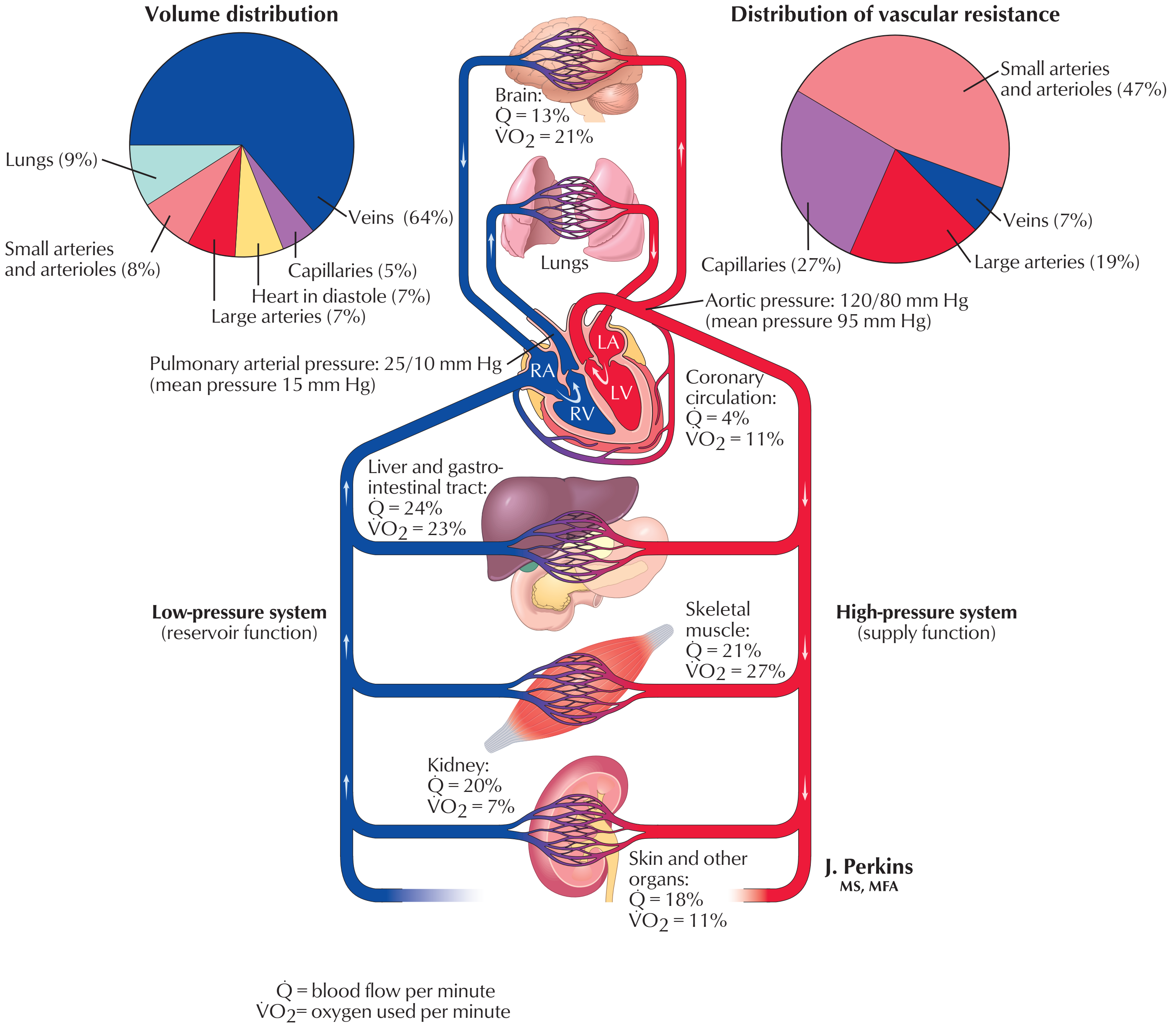
Features of a Typical Peripheral Nerve

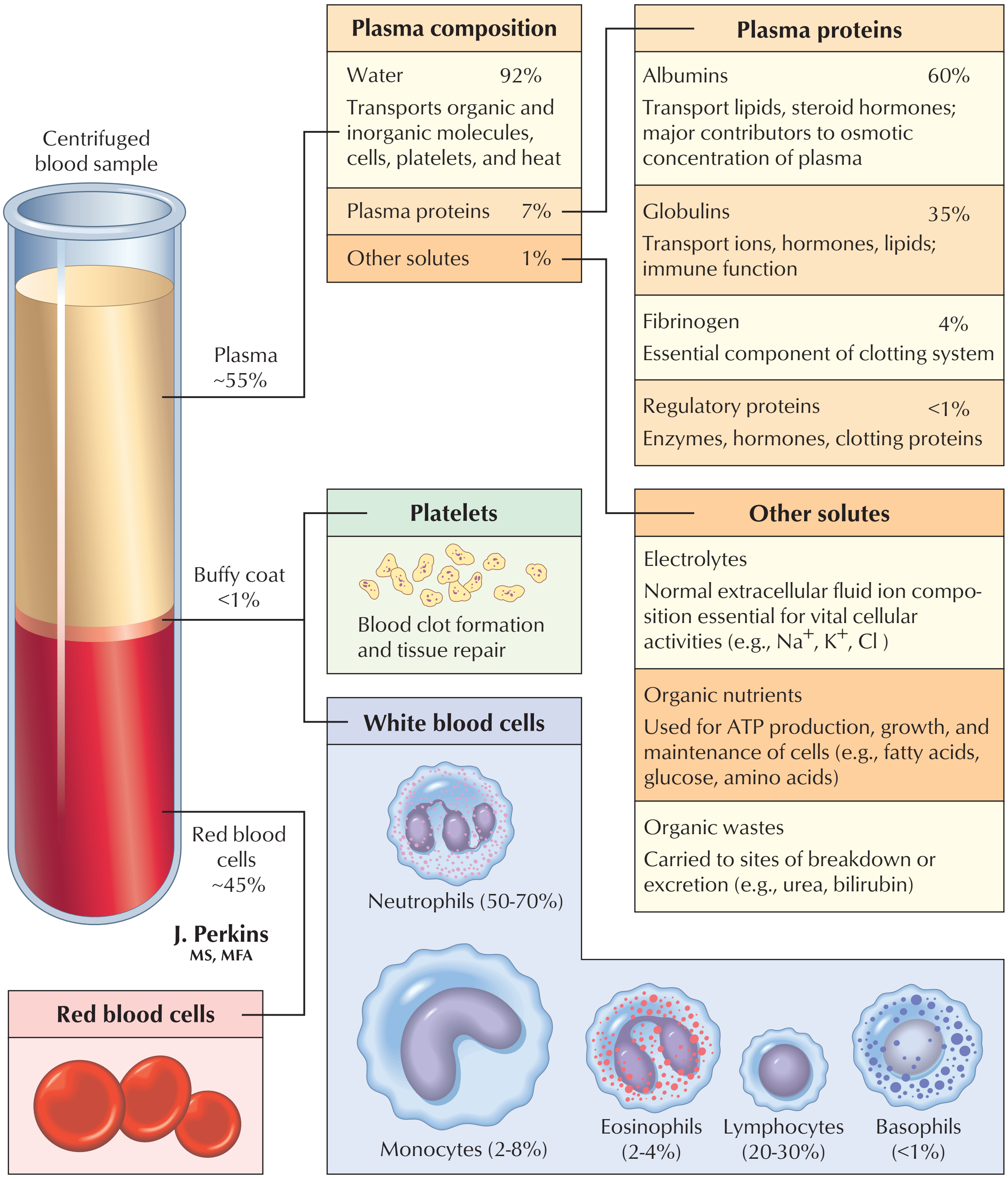

Longitudinal vessels
Outer epineurium
Inner epineurium
Fascicle
Nerve fiber bundles
Fascicle
Perineurium
Nerve fibers
Endoneurium


Cell body of an oligodendrocyte (neurilemmal cells play similar role in peripheral nervous system)
Cell membrane of myelinated axon
Mitochondrion in cytoplasm of neuronal axon
Node of Ranvier
Minute masses of cytoplasm trapped between fused layers of cell membrane of oligodendrocyte
Fused layers of cell membrane of oligodendrocyte wrapped around axon of a myelinated neuron of central nervous system (the lipid of lipoprotein constituting fused cell membrane is myelin, which gives myelinated axon a white, glistening appearance)


Liver, gallbladder, and duodenum (irritation of respiratory diaphragm)
C. Machado M.D.
Duodenum, head of pancreas
Gallbladder
Liver
Stomach
Spleen
Small intestine
Kidney and ureter
Cecum and ascending colon
Sigmoid colon
Gallbladder
Liver

General Organization of the Cardiovascular System


Volume distribution
Lungs (9%)
Small arteries and arterioles (8%)
Large arteries (7%)
Heart in diastole (7%)
Capillaries (5%)
Veins (64%)
Distribution of vascular resistance
Small arteries and arterioles (47%)
Veins (7%)
Large arteries (19%)
Capillaries (27%)
Brain:
$\dot{Q} = 13\%$
$\dot{V}O_2 = 21\%$
Lungs
Aortic pressure: 120/80 mm Hg
(mean pressure 95 mm Hg)
Pulmonary arterial pressure: 25/10 mm Hg
(mean pressure 15 mm Hg)
LA
RA
LV
RV
Coronary circulation:
$\dot{Q} = 4\%$
$\dot{V}O_2 = 11\%$
Liver and gastro-intestinal tract:
$\dot{Q} = 24\%$
$\dot{V}O_2 = 23\%$
Low-pressure system
(reservoir function)
High-pressure system
(supply function)
Skeletal muscle:
$\dot{Q} = 21\%$
$\dot{V}O_2 = 27\%$
Kidney:
$\dot{Q} = 20\%$
$\dot{V}O_2 = 7\%$
Skin and other organs:
$\dot{Q} = 18\%$
$\dot{V}O_2 = 11\%$
J. Perkins
MS, MFA
$\dot{Q}$ = blood flow per minute
$\dot{V}O_2$ = oxygen used per minute


Centrifuged blood sample
Plasma ~55%
Buffy coat <1%
Red blood cells ~45%
J. Perkins
MS, MFA
Neutrophils (50-70%)
Monocytes (2-8%)
Eosinophils (2-4%)
Lymphocytes (20-30%)
Basophils (<1%)

Plasma composition

Water Transports organic and inorganic molecules, cells, platelets, and heat	92%
Plasma proteins	7%
Other solutes	1%

Plasma proteins

Albumins Transport lipids, steroid hormones; major contributors to osmotic concentration of plasma	60%
Globulins Transport ions, hormones, lipids; immune function	35%
Fibrinogen Essential component of clotting system	4%
Regulatory proteins Enzymes, hormones, clotting proteins	<1%

Other solutes

Electrolytes
Normal extracellular fluid ion composition essential for vital cellular activities (e.g., Na$^+$, K$^+$, Cl)

Organic nutrients
Used for ATP production, growth, and maintenance of cells (e.g., fatty acids, glucose, amino acids)

Organic wastes
Carried to sites of breakdown or excretion (e.g., urea, bilirubin)

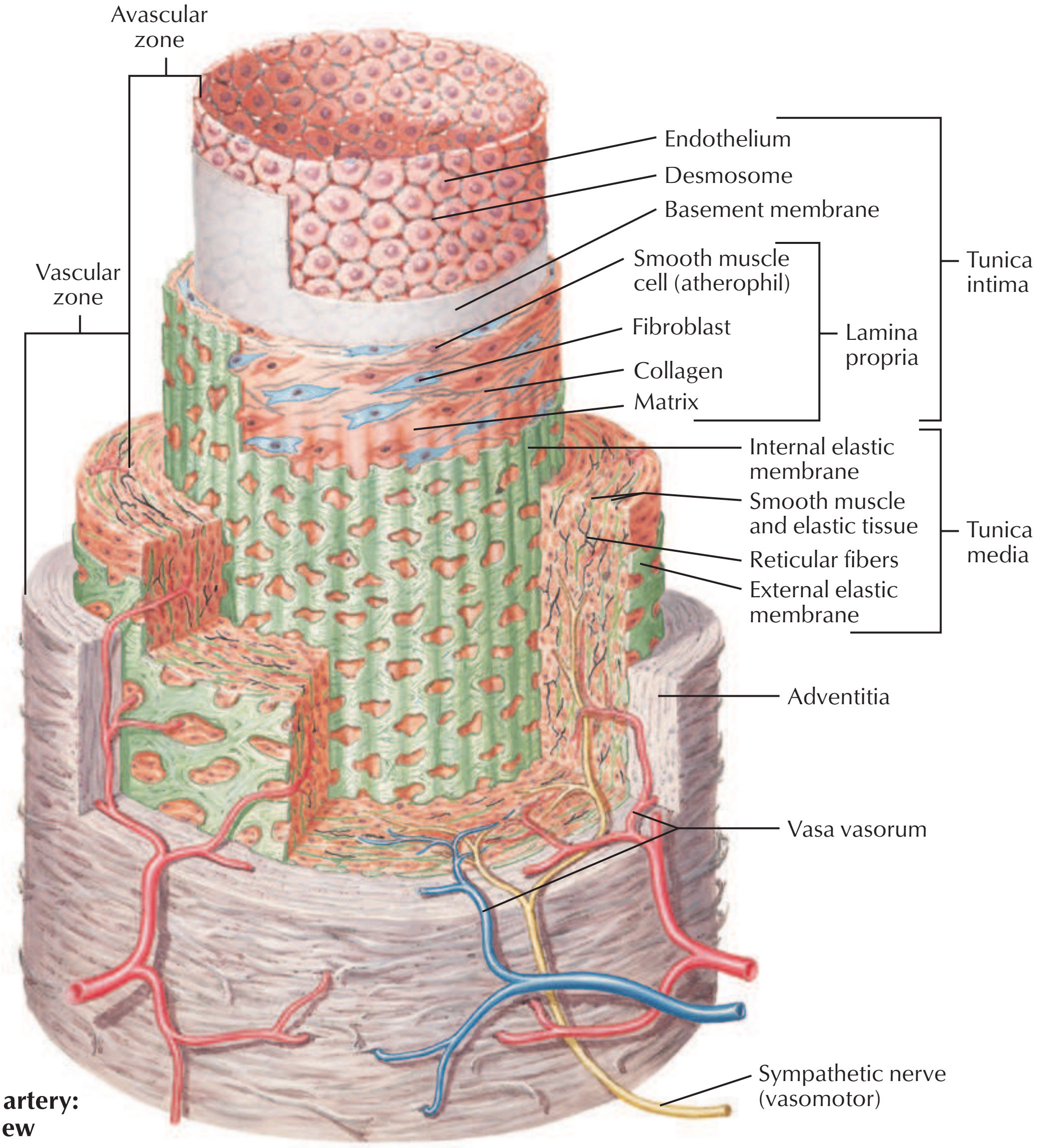
Platelets

Blood clot formation and tissue repair

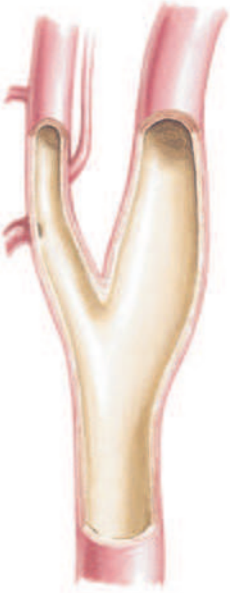
White blood cells

Red blood cells

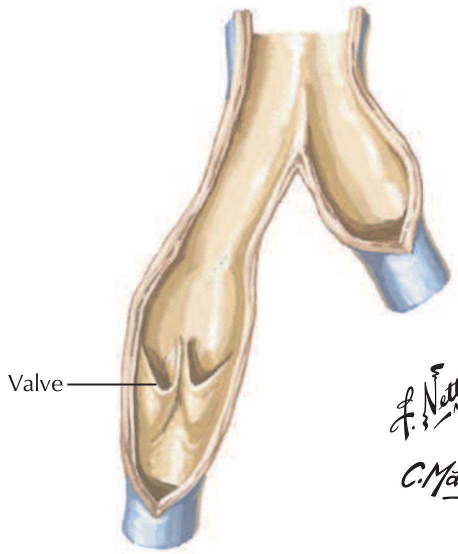
Arterial Wall


Avascular zone
Vascular zone
Endothelium
Desmosome
Basement membrane
Smooth muscle cell (atherophil)
Fibroblast
Collagen
Matrix
Lamina propria
Tunica intima
Internal elastic membrane
Smooth muscle and elastic tissue
Reticular fibers
External elastic membrane
Tunica media
Adventitia
Vasa vasorum
Sympathetic nerve (vasomotor)

Wall of an artery: cutaway view



Healthy artery



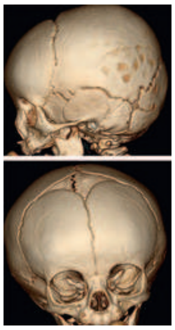
Healthy vein

HEAD AND NECK

2

Surface Anatomy 8
Superficial Head and Neck 9-10
Bones and Ligaments 11-30
Neck 31-41
Nasal Region 42-64
Oral Region 65-74
Pharynx 75-86
Thyroid Gland and Larynx 87-93
Orbit and Contents 94-104
Ear 105-110
Meninges and Brain 111-126
Cranial and Cervical Nerves 127-146
Cerebral Vasculature 147-158
Regional Imaging 159-160
Structures with High Clinical Significance Tables 2.1-2.3
Muscle Tables Tables 2.4-2.9
Electronic Bonus Plates BP17-BP32

ELECTRONIC BONUS PLATES


BP17 3D Skull Reconstruction CTs

BP18 Degenerative Changes in Cervical Vertebrae

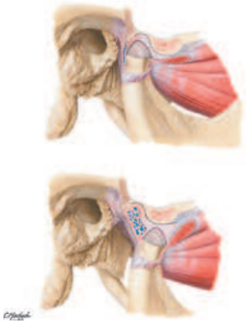
BP19 Atlantooccipital Junction

BP20 Muscles of Facial Expression: Anterior View

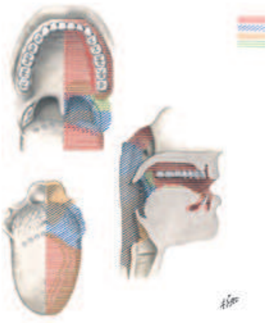
BP21 Musculature of Face

BP22 Paranasal Sinuses

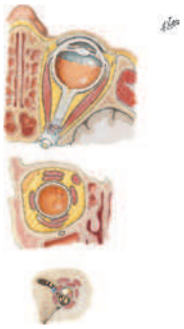
BP23 Subclavian Artery


BP24 Opening of the Mandible

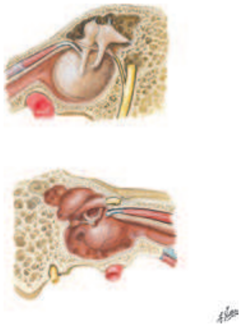
ELECTRONIC BONUS PLATES—*cont'd*



BP25 Afferent Innervation of Oral Cavity and Pharynx

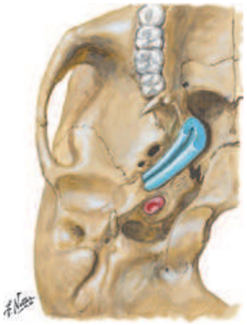


BP26 Fasciae of Orbit and Eyeball



BP27 Tympanic Cavity

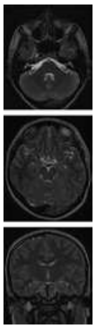
BP28 Anatomy of the Pediatric Ear



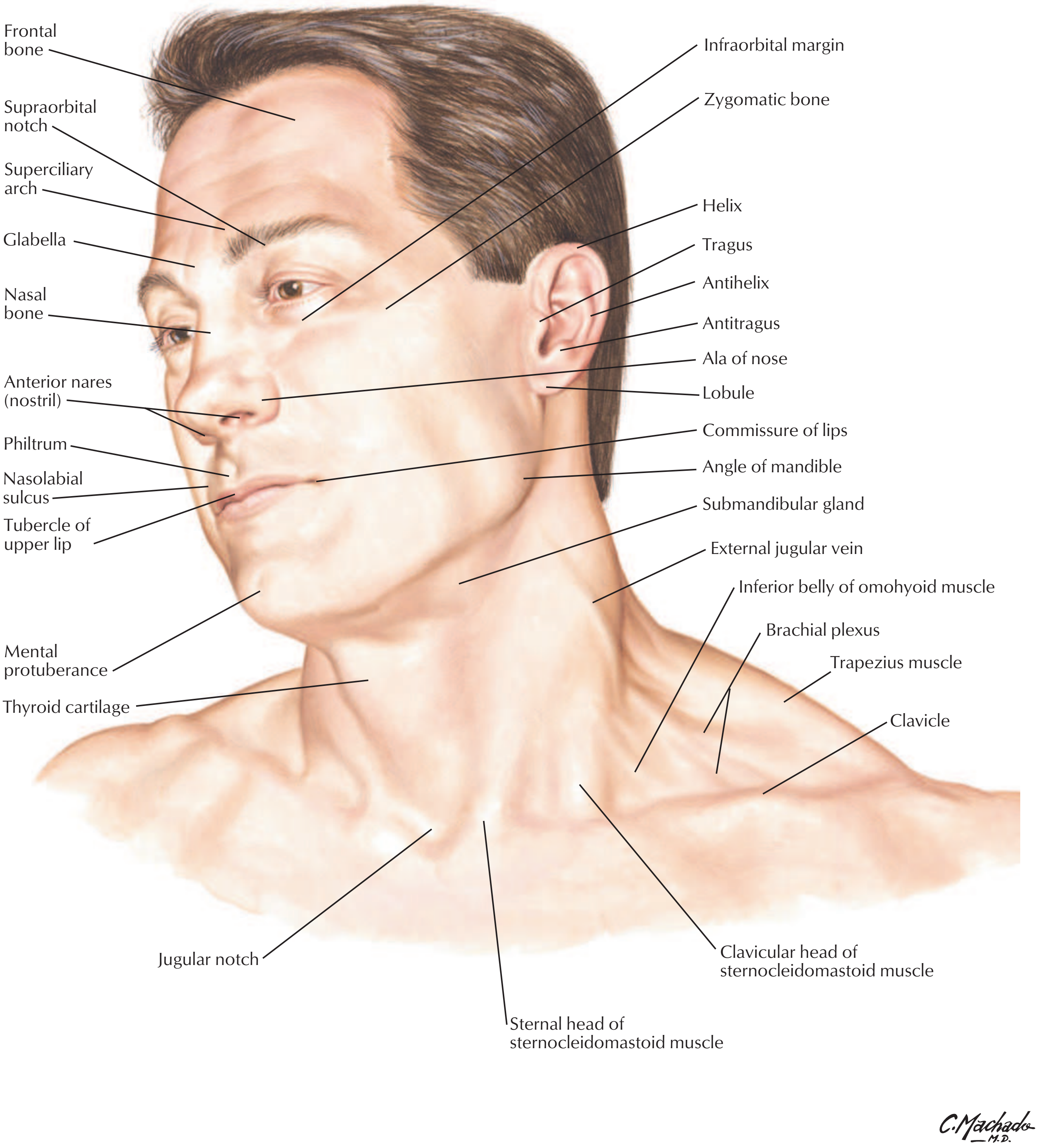
BP29 Auditory Tube (Eustachian)

BP30 Arteries and Veins of Hypothalamus and Hypophysis

BP31 Cranial Imaging (MRV and MRA)

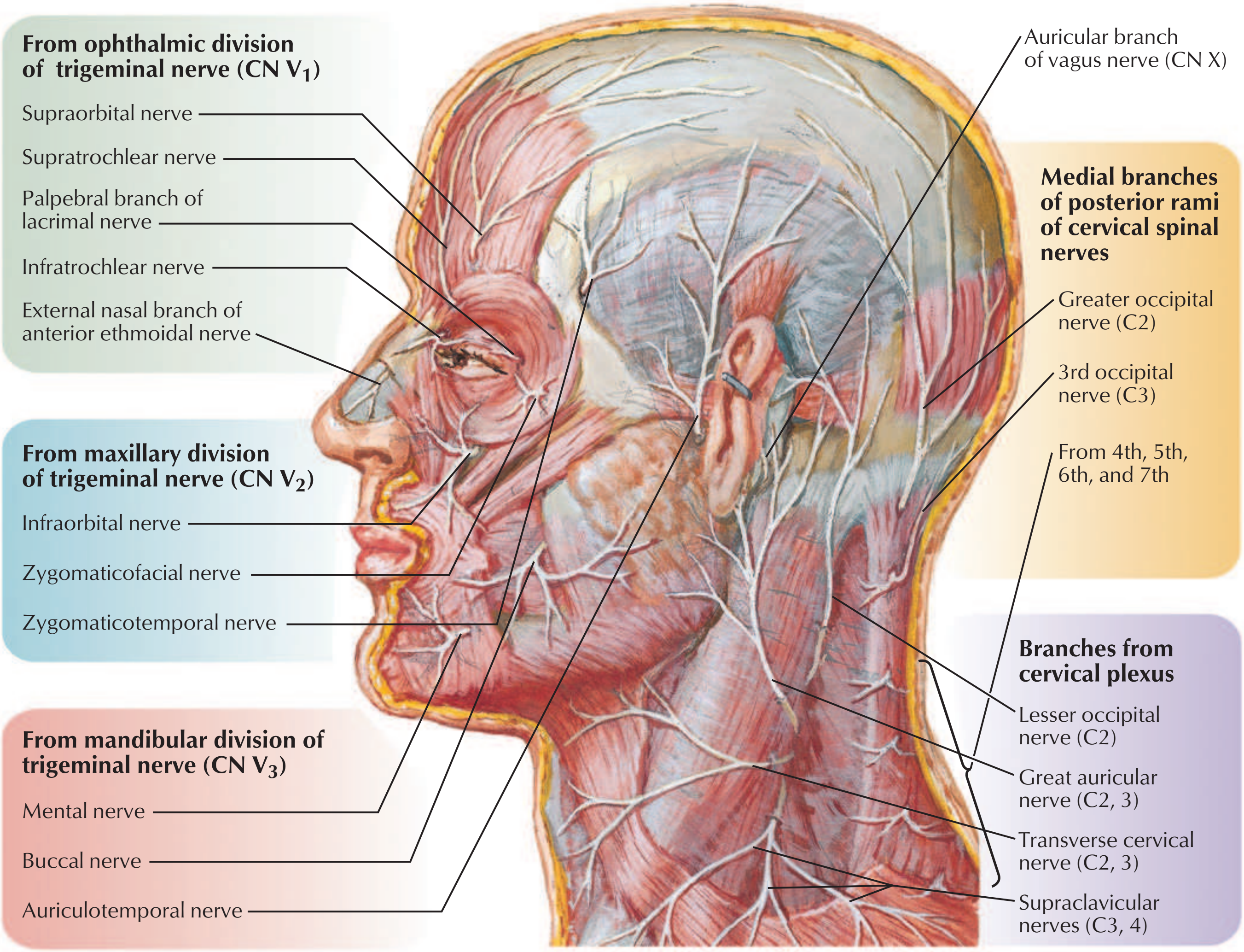


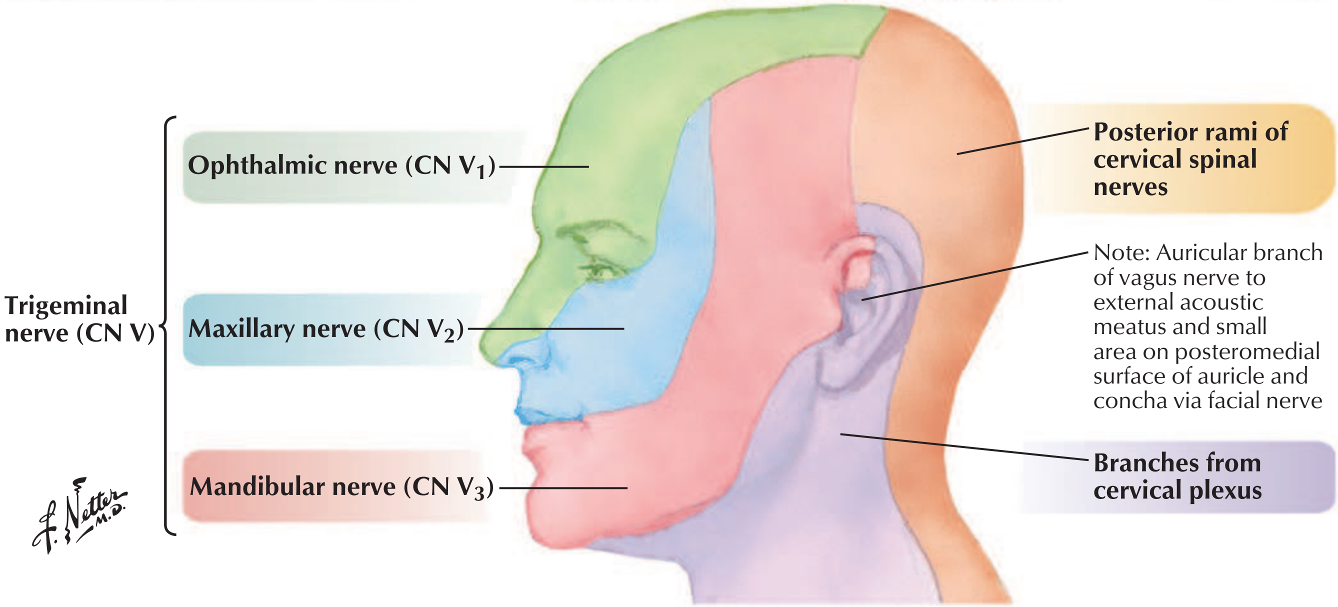
BP32 Axial and Coronal MRIs of Brain


Frontal bone
Supraorbital notch
Superciliary arch
Glabella
Nasal bone
Anterior nares (nostril)
Philtrum
Nasolabial sulcus
Tubercle of upper lip
Mental protuberance
Thyroid cartilage
Jugular notch
Infraorbital margin
Zygomatic bone
Helix
Tragus
Antihelix
Antitragus
Ala of nose
Lobule
Commissure of lips
Angle of mandible
Submandibular gland
External jugular vein
Inferior belly of omohyoid muscle
Brachial plexus
Trapezius muscle
Clavicle
Clavicular head of sternocleidomastoid muscle
Sternal head of sternocleidomastoid muscle
C. Machado M.D.

Cutaneous Nerves of Head and Neck

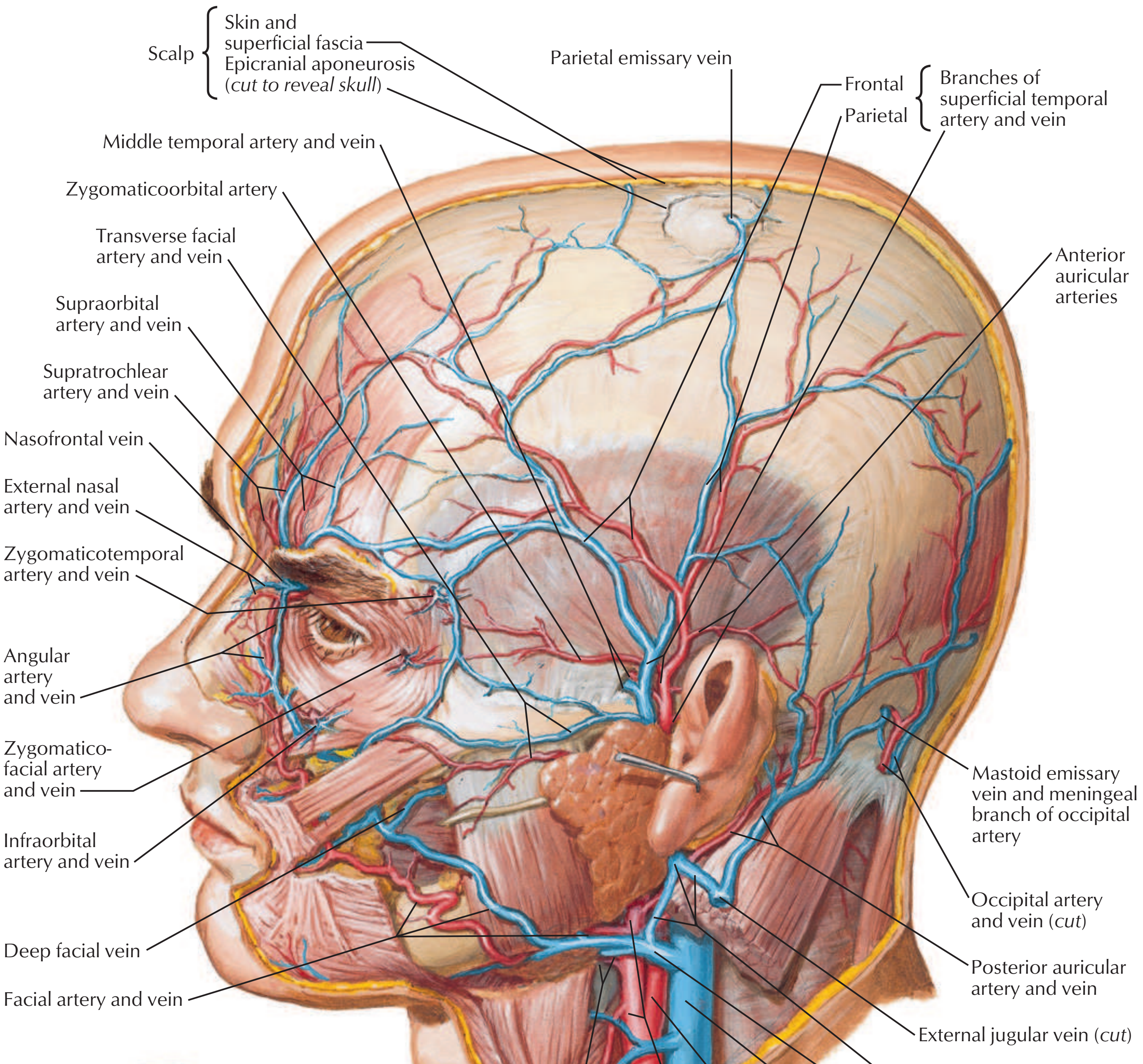
See also Plates 39, 42, 61

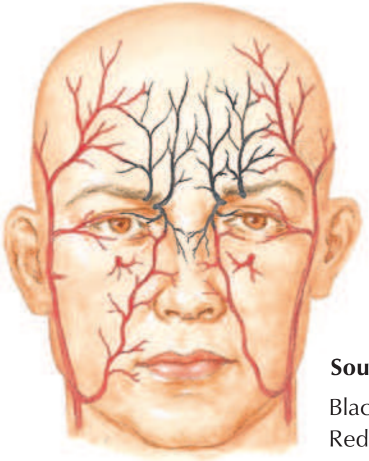

From ophthalmic division of trigeminal nerve (CN V$_1$)
Supraorbital nerve
Supratrochlear nerve
Palpebral branch of lacrimal nerve
Infratrochlear nerve
External nasal branch of anterior ethmoidal nerve
From maxillary division of trigeminal nerve (CN V$_2$)
Infraorbital nerve
Zygomaticofacial nerve
Zygomaticotemporal nerve
From mandibular division of trigeminal nerve (CN V$_3$)
Mental nerve
Buccal nerve
Auriculotemporal nerve
Auricular branch of vagus nerve (CN X)
Medial branches of posterior rami of cervical spinal nerves
Greater occipital nerve (C2)
3rd occipital nerve (C3)
From 4th, 5th, 6th, and 7th
Branches from cervical plexus
Lesser occipital nerve (C2)
Great auricular nerve (C2, 3)
Transverse cervical nerve (C2, 3)
Supraclavicular nerves (C3, 4)


Trigeminal nerve (CN V)
Ophthalmic nerve (CN V$_1$)
Maxillary nerve (CN V$_2$)
Mandibular nerve (CN V$_3$)
Posterior rami of cervical spinal nerves
Note: Auricular branch of vagus nerve to external acoustic meatus and small area on posteromedial surface of auricle and concha via facial nerve
Branches from cervical plexus

Superficial Arteries and Veins of Face and Scalp

See also Plates 57, 83, 84


Scalp
Skin and superficial fascia
Epicranial aponeurosis (*cut to reveal skull*)
Parietal emissary vein
Frontal
Parietal
Branches of superficial temporal artery and vein
Middle temporal artery and vein
Zygomaticoorbital artery
Transverse facial artery and vein
Supraorbital artery and vein
Supratrochlear artery and vein
Nasofrontal vein
External nasal artery and vein
Zygomaticotemporal artery and vein
Angular artery and vein
Zygomatico-facial artery and vein
Infraorbital artery and vein
Deep facial vein
Facial artery and vein
Anterior auricular arteries
Mastoid emissary vein and meningeal branch of occipital artery
Occipital artery and vein (*cut*)
Posterior auricular artery and vein
External jugular vein (*cut*)
Retromandibular vein
Common facial vein
Internal jugular vein
Internal carotid artery
External carotid artery
Common carotid artery
Lingual artery and vein



Sources of arterial supply of face

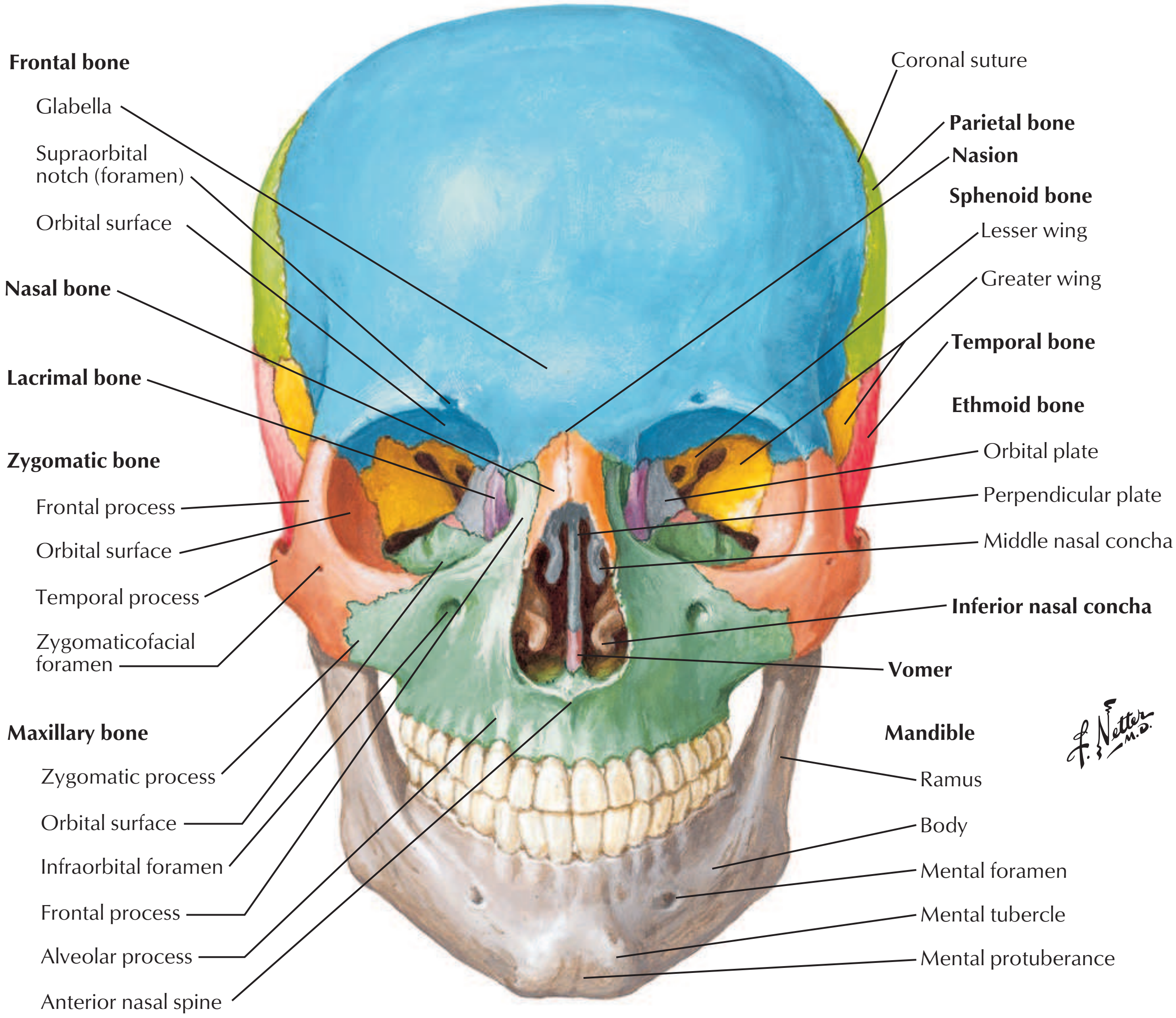
Black: from internal carotid artery (via ophthalmic artery)

Red: from external carotid artery

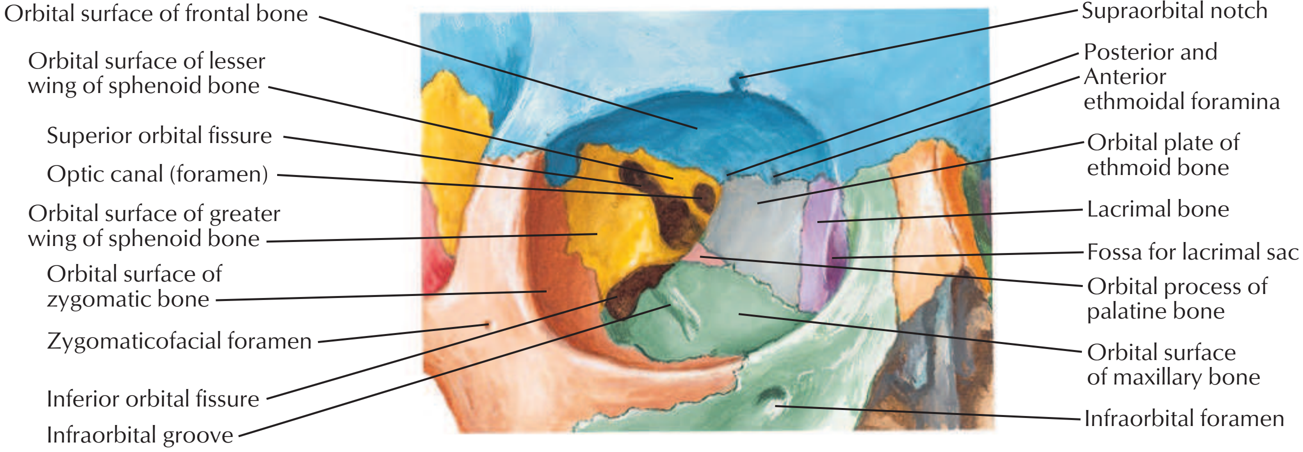
F. Netter M.D.

Skull: Anterior View

See also Plate 13

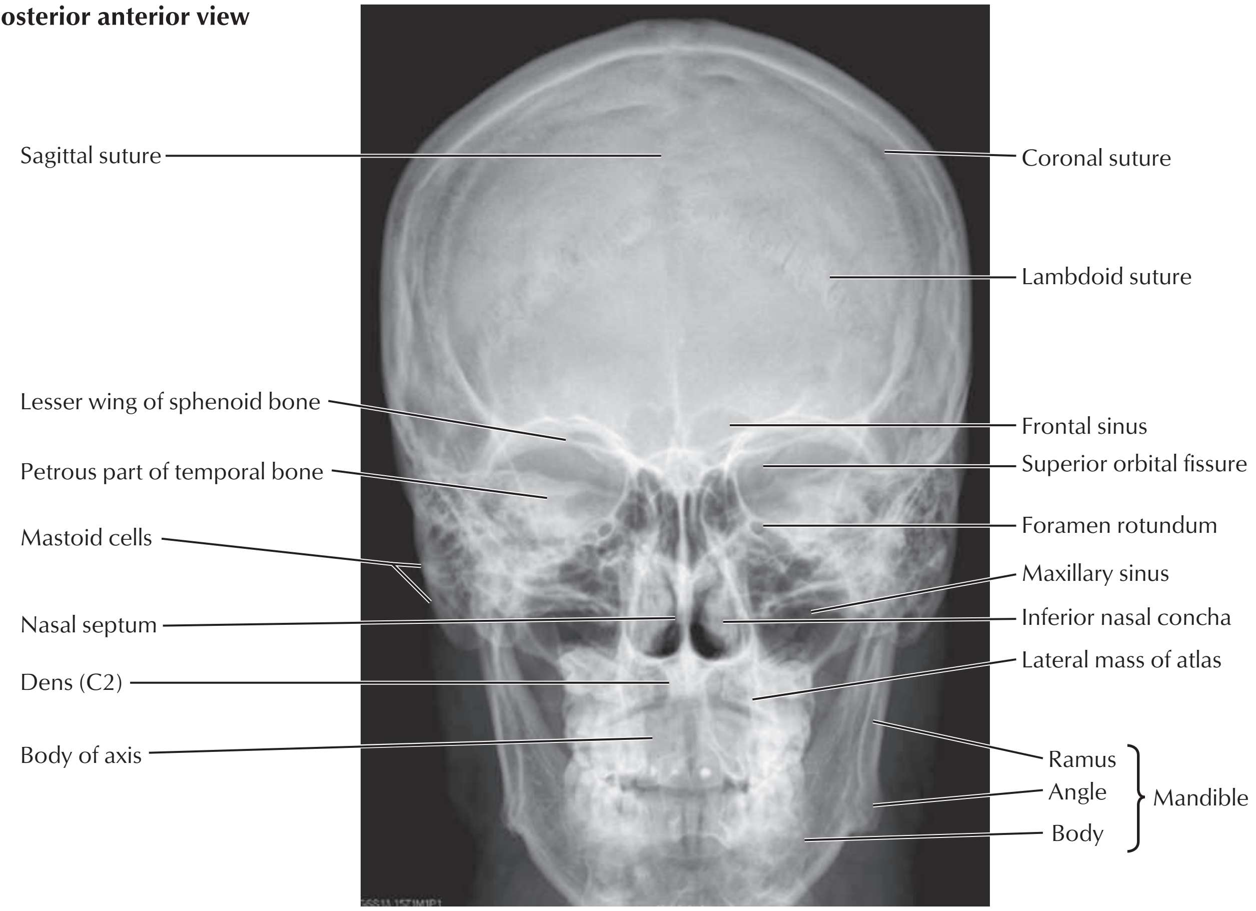

Frontal bone
Glabella
Supraorbital notch (foramen)
Orbital surface
Nasal bone
Lacrimal bone
Zygomatic bone
Frontal process
Orbital surface
Temporal process
Zygomaticofacial foramen
Maxillary bone
Zygomatic process
Orbital surface
Infraorbital foramen
Frontal process
Alveolar process
Anterior nasal spine
Coronal suture
Parietal bone
Nasion
Sphenoid bone
Lesser wing
Greater wing
Temporal bone
Ethmoid bone
Orbital plate
Perpendicular plate
Middle nasal concha
Inferior nasal concha
Vomer
Mandible
Ramus
Body
Mental foramen
Mental tubercle
Mental protuberance

Right orbit: frontal view

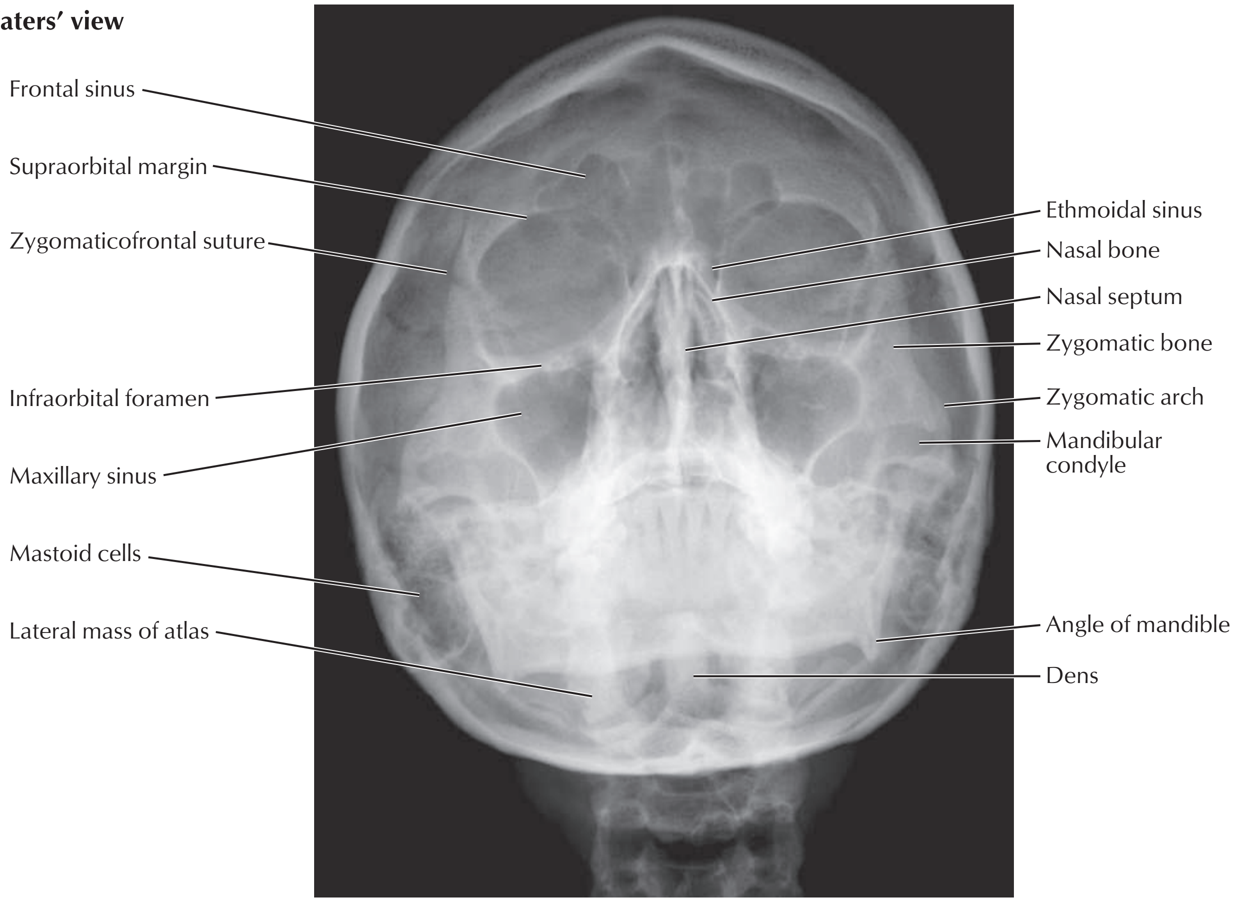

Orbital surface of frontal bone
Orbital surface of lesser wing of sphenoid bone
Superior orbital fissure
Optic canal (foramen)
Orbital surface of greater wing of sphenoid bone
Orbital surface of zygomatic bone
Zygomaticofacial foramen
Inferior orbital fissure
Infraorbital groove
Supraorbital notch
Posterior and Anterior ethmoidal foramina
Orbital plate of ethmoid bone
Lacrimal bone
Fossa for lacrimal sac
Orbital process of palatine bone
Orbital surface of maxillary bone
Infraorbital foramen

See also **Plate 11**

Posterior anterior view

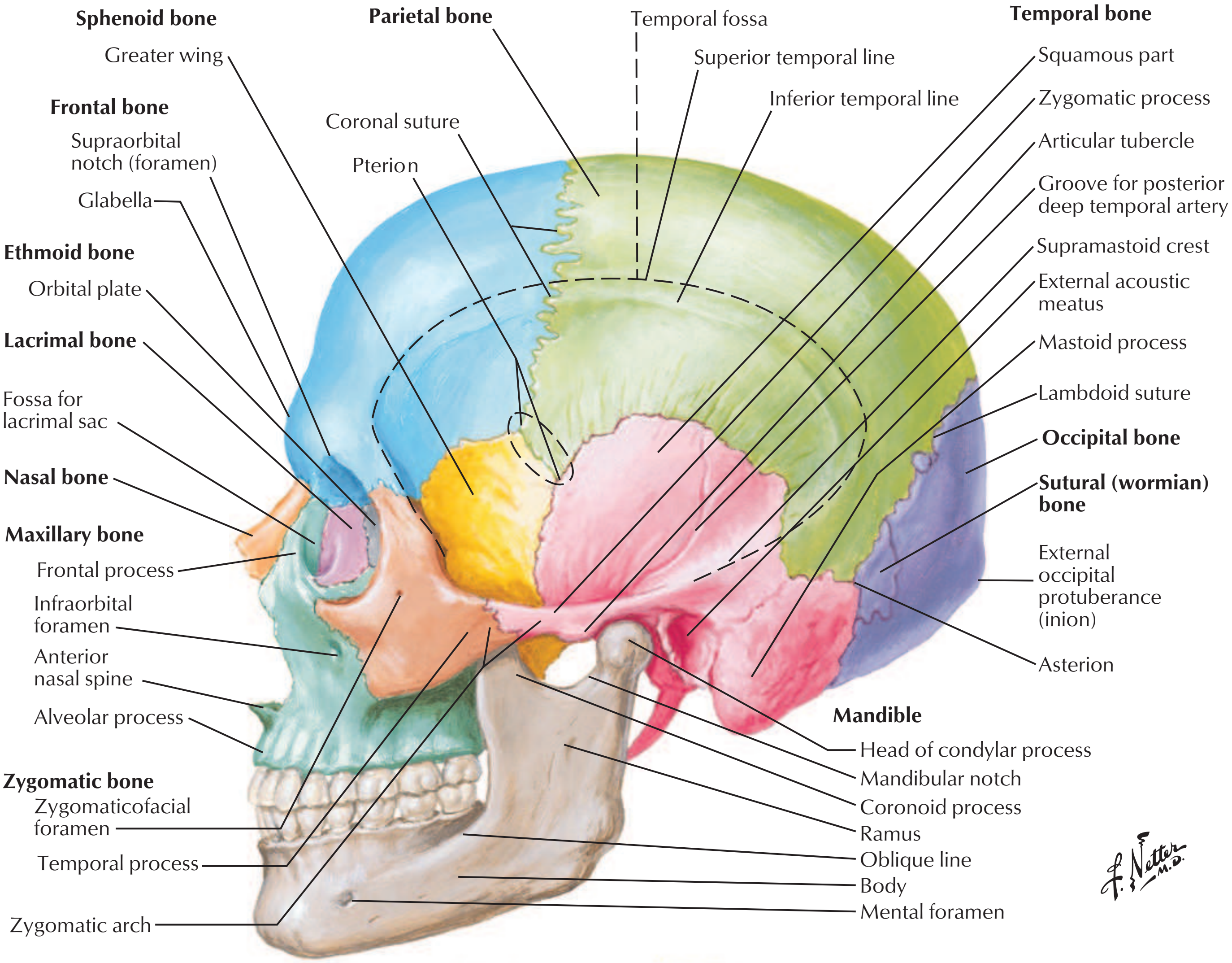

Sagittal suture
Coronal suture
Lambdoid suture
Lesser wing of sphenoid bone
Frontal sinus
Petrous part of temporal bone
Superior orbital fissure
Mastoid cells
Foramen rotundum
Maxillary sinus
Nasal septum
Inferior nasal concha
Lateral mass of atlas
Dens (C2)
Body of axis
Ramus
Angle
Body
Mandible

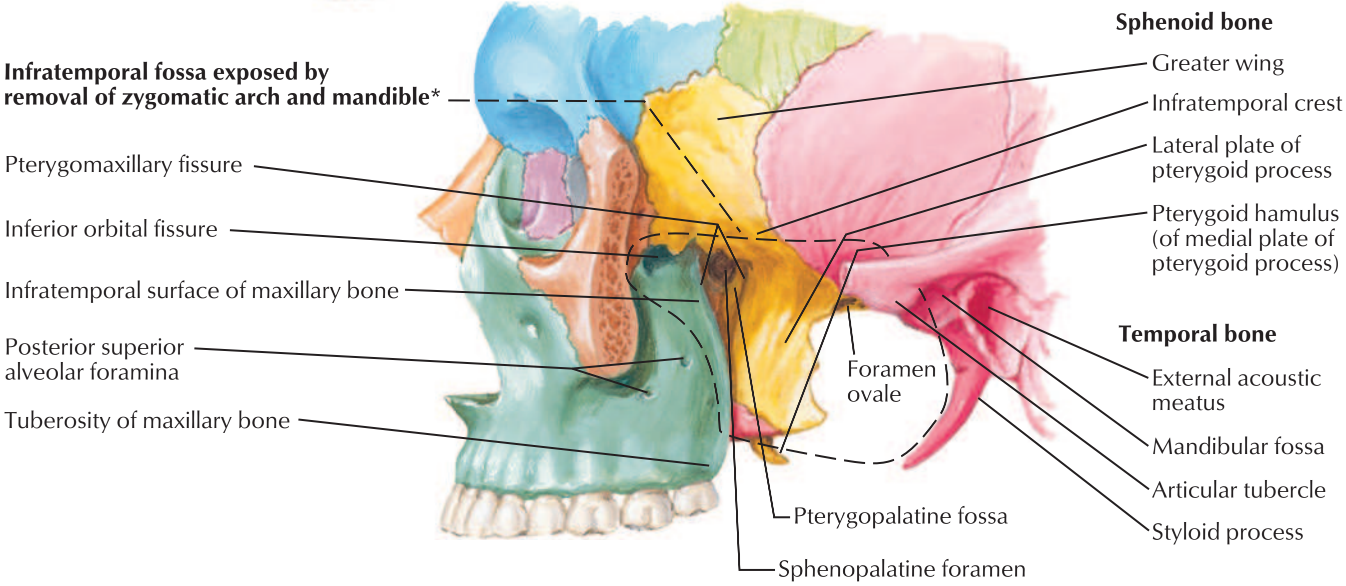
Waters' view


Frontal sinus
Supraorbital margin
Zygomaticofrontal suture
Ethmoidal sinus
Nasal bone
Nasal septum
Zygomatic bone
Infraorbital foramen
Zygomatic arch
Mandibular condyle
Maxillary sinus
Mastoid cells
Angle of mandible
Lateral mass of atlas
Dens

Skull: Lateral View

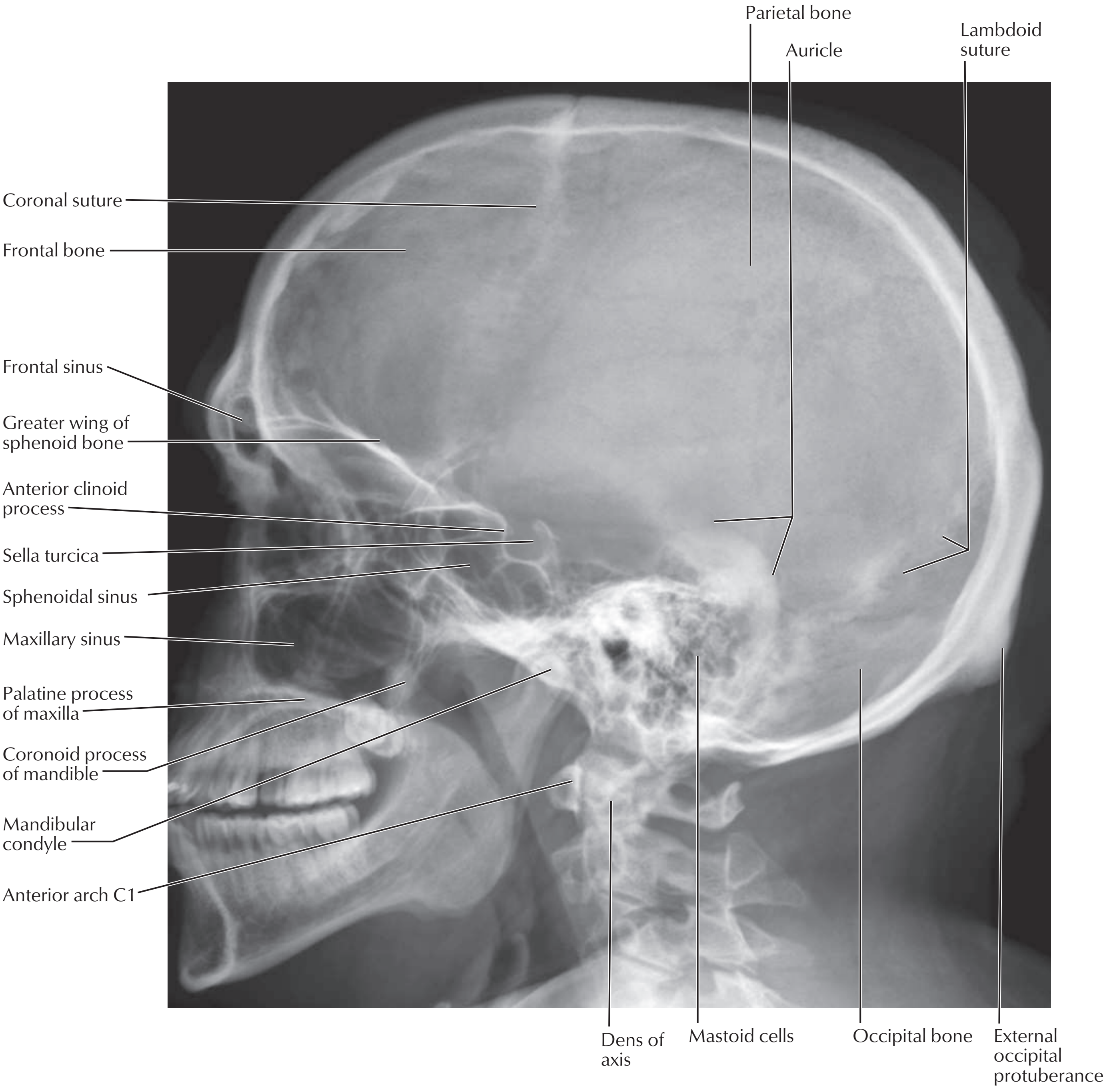
See also Plates 14, 15, 22


Sphenoid bone
Greater wing
Frontal bone
Supraorbital notch (foramen)
Glabella
Ethmoid bone
Orbital plate
Lacrimal bone
Fossa for lacrimal sac
Nasal bone
Maxillary bone
Frontal process
Infraorbital foramen
Anterior nasal spine
Alveolar process
Zygomatic bone
Zygomaticofacial foramen
Temporal process
Zygomatic arch
Parietal bone
Coronal suture
Pterion
Temporal fossa
Superior temporal line
Inferior temporal line
Temporal bone
Squamous part
Zygomatic process
Articular tubercle
Groove for posterior deep temporal artery
Supramastoid crest
External acoustic meatus
Mastoid process
Lambdoid suture
Occipital bone
Sutural (wormian) bone
External occipital protuberance (inion)
Asterion
Mandible
Head of condylar process
Mandibular notch
Coronoid process
Ramus
Oblique line
Body
Mental foramen


Infratemporal fossa exposed by removal of zygomatic arch and mandible*
Pterygomaxillary fissure
Inferior orbital fissure
Infratemporal surface of maxillary bone
Posterior superior alveolar foramina
Tuberosity of maxillary bone
Sphenoid bone
Greater wing
Infratemporal crest
Lateral plate of pterygoid process
Pterygoid hamulus (of medial plate of pterygoid process)
Foramen ovale
Temporal bone
External acoustic meatus
Mandibular fossa
Articular tubercle
Styloid process
Pterygopalatine fossa
Sphenopalatine foramen

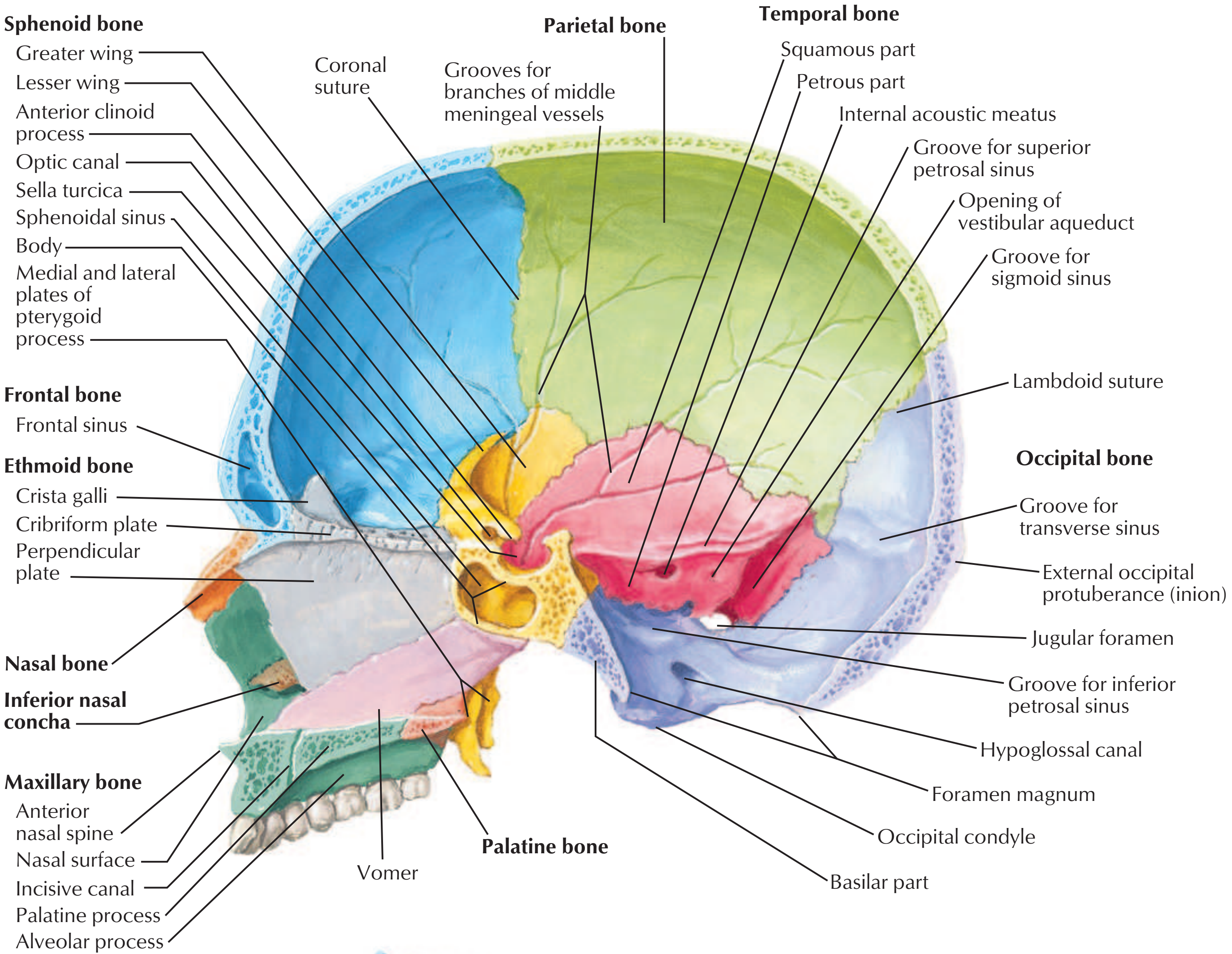
*Superficially, mastoid process forms posterior boundary.

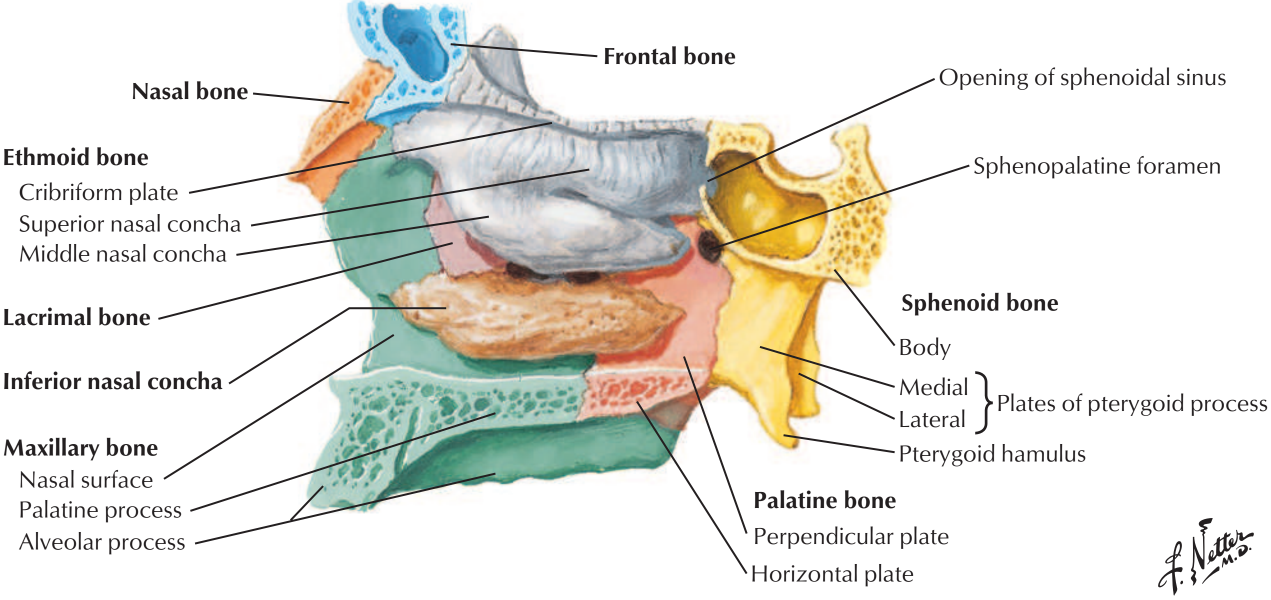
See also Plate 15


Parietal bone
Auricle
Lambdoid suture
Coronal suture
Frontal bone
Frontal sinus
Greater wing of sphenoid bone
Anterior clinoid process
Sella turcica
Sphenoidal sinus
Maxillary sinus
Palatine process of maxilla
Coronoid process of mandible
Mandibular condyle
Anterior arch C1
Dens of axis
Mastoid cells
Occipital bone
External occipital protuberance

Skull: Midsagittal Section

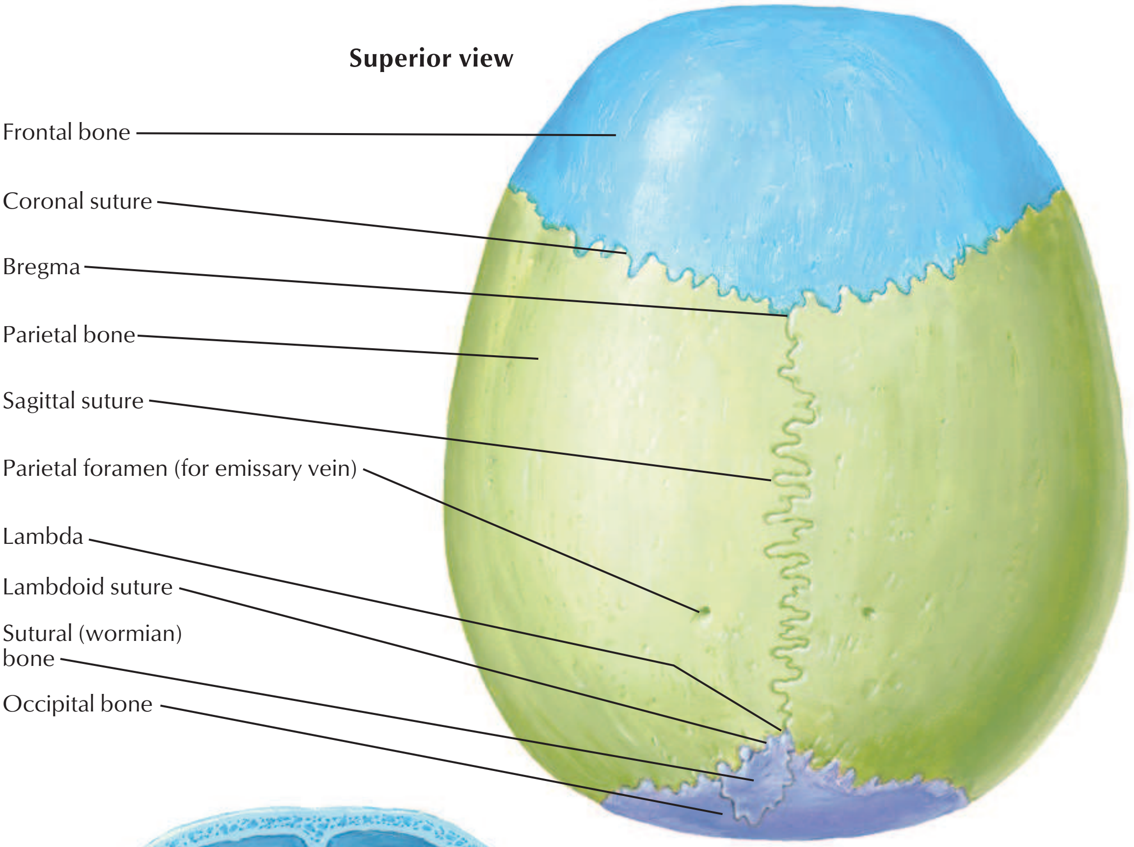
See also Plates 44, 46


Sphenoid bone
Greater wing
Lesser wing
Anterior clinoid process
Optic canal
Sella turcica
Sphenoidal sinus
Body
Medial and lateral plates of pterygoid process
Coronal suture
Grooves for branches of middle meningeal vessels
Parietal bone
Temporal bone
Squamous part
Petrous part
Internal acoustic meatus
Groove for superior petrosal sinus
Opening of vestibular aqueduct
Groove for sigmoid sinus
Lambdoid suture
Frontal bone
Frontal sinus
Ethmoid bone
Crista galli
Cribriform plate
Perpendicular plate
Occipital bone
Groove for transverse sinus
External occipital protuberance (inion)
Jugular foramen
Nasal bone
Groove for inferior petrosal sinus
Inferior nasal concha
Hypoglossal canal
Maxillary bone
Anterior nasal spine
Nasal surface
Incisive canal
Palatine process
Alveolar process
Foramen magnum
Occipital condyle
Palatine bone
Vomer
Basilar part

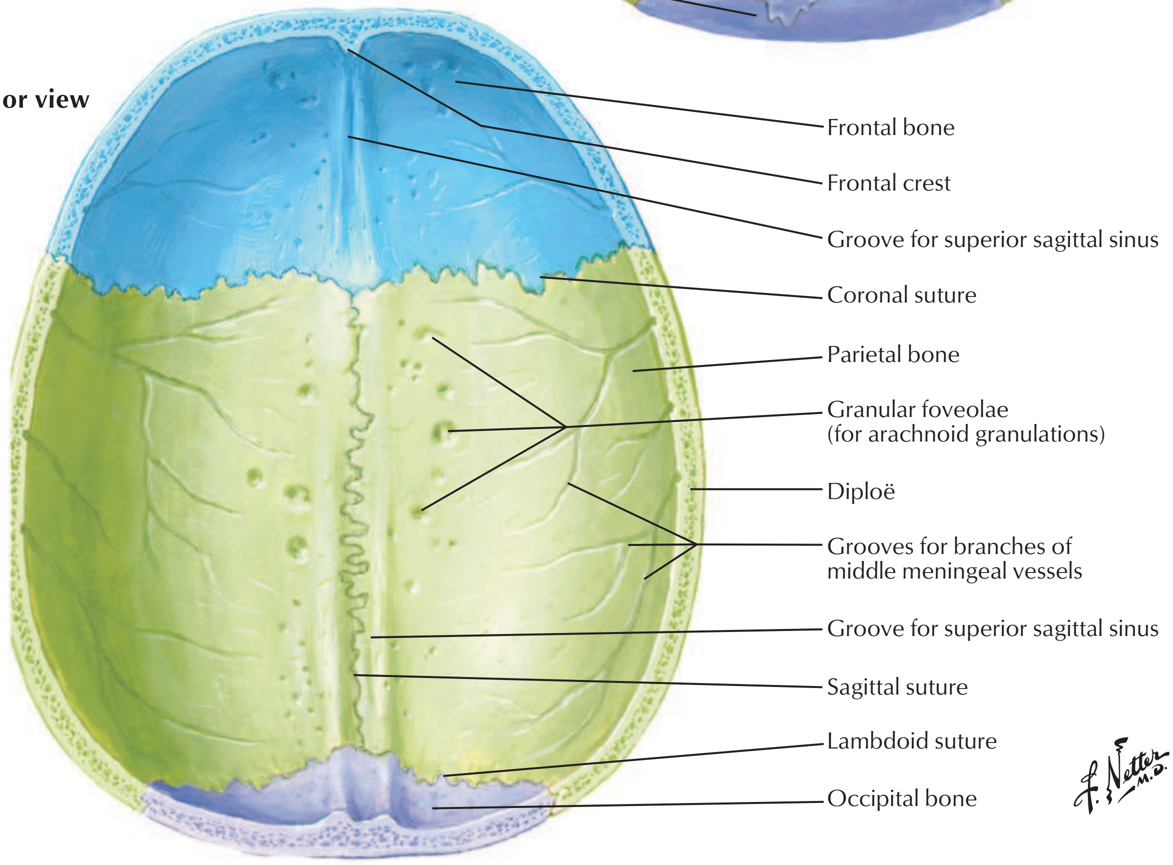

Frontal bone
Nasal bone
Opening of sphenoidal sinus
Sphenopalatine foramen
Ethmoid bone
Cribriform plate
Superior nasal concha
Middle nasal concha
Lacrimal bone
Inferior nasal concha
Sphenoid bone
Body
Medial
Lateral
Plates of pterygoid process
Pterygoid hamulus
Maxillary bone
Nasal surface
Palatine process
Alveolar process
Palatine bone
Perpendicular plate
Horizontal plate

View of lateral nasal wall with nasal septum removed

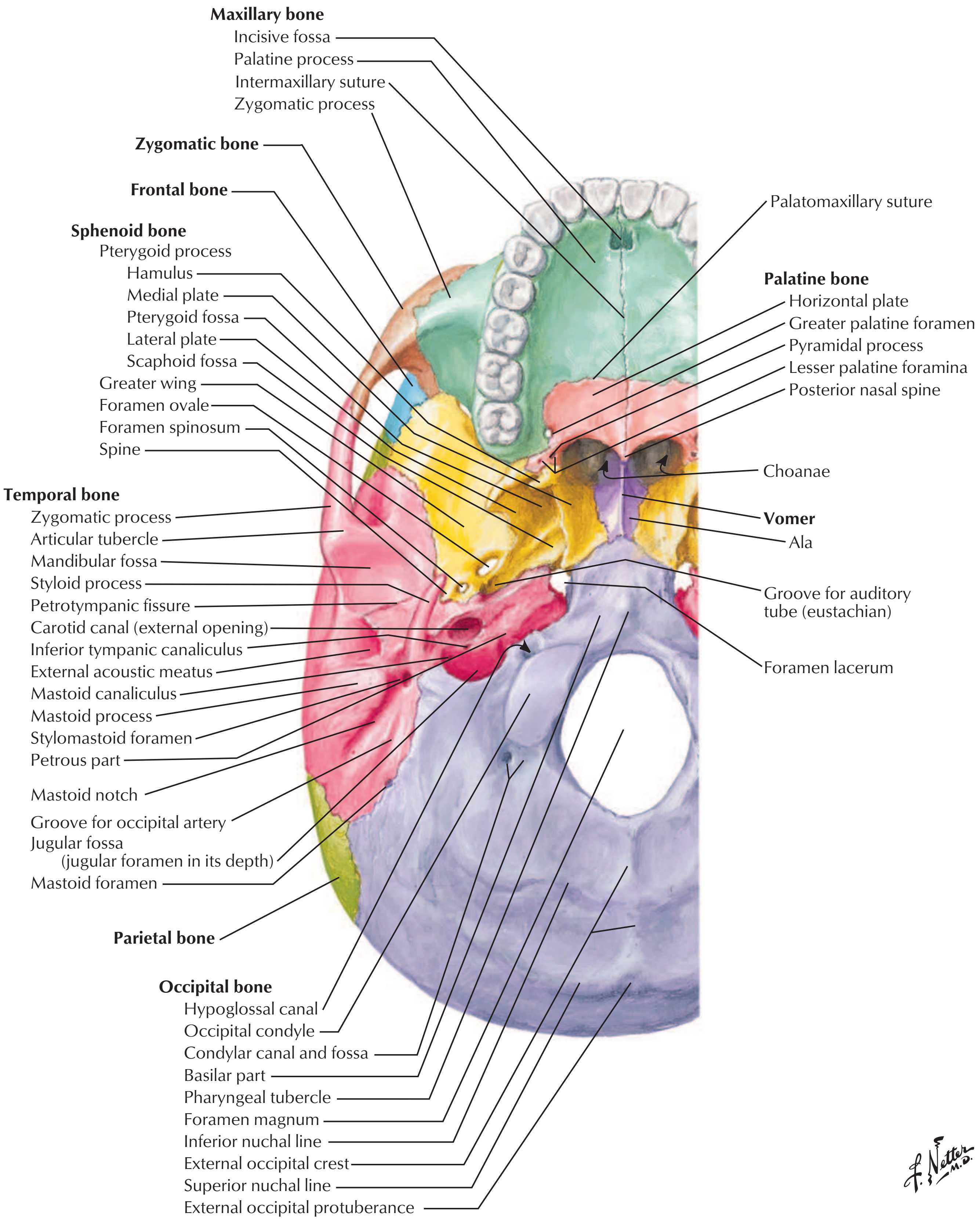
Superior view


Frontal bone
Coronal suture
Bregma
Parietal bone
Sagittal suture
Parietal foramen (for emissary vein)
Lambda
Lambdoid suture
Sutural (wormian)
bone
Occipital bone

Inferior view

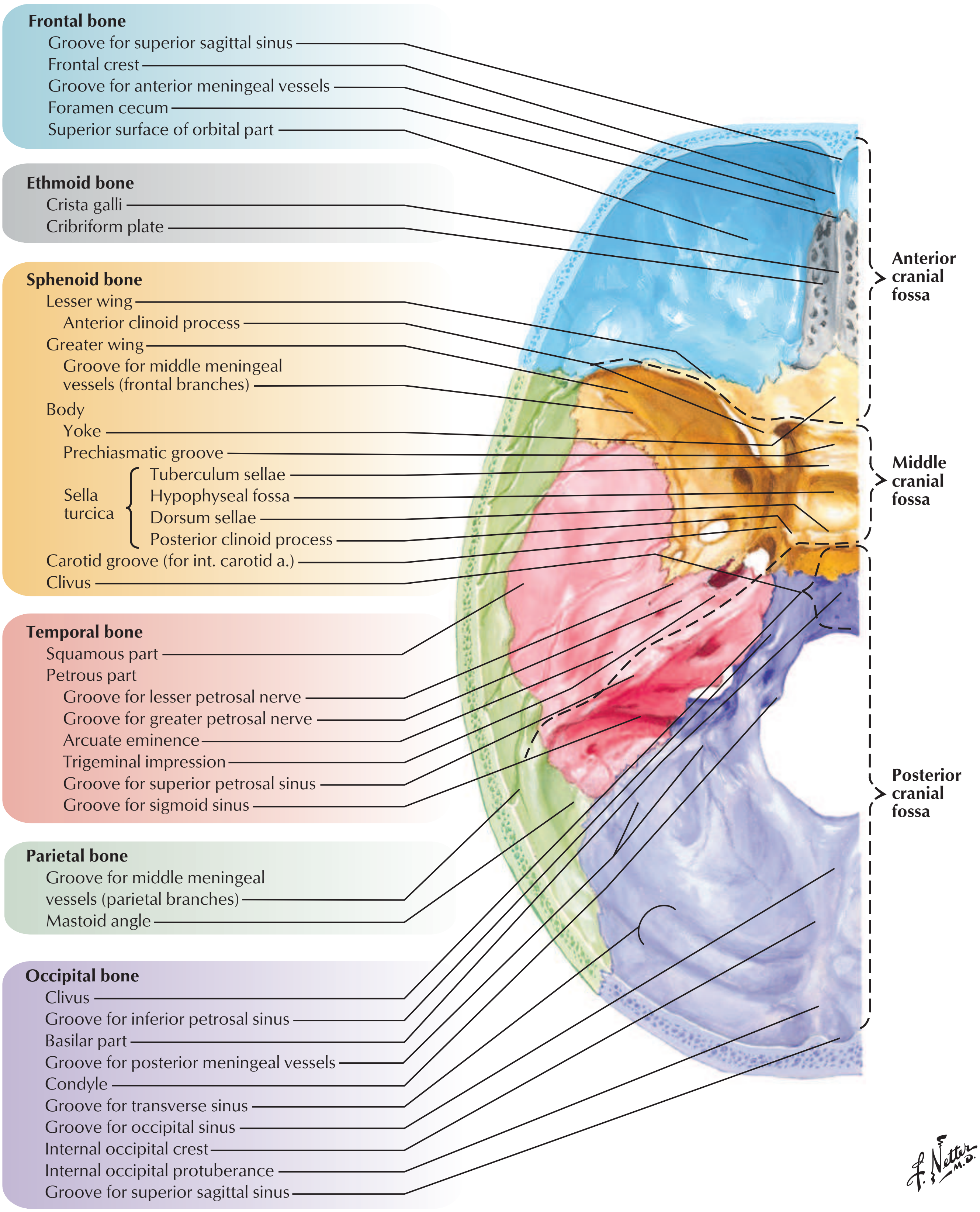

Frontal bone
Frontal crest
Groove for superior sagittal sinus
Coronal suture
Parietal bone
Granular foveolae
(for arachnoid granulations)
Diploë
Grooves for branches of
middle meningeal vessels
Groove for superior sagittal sinus
Sagittal suture
Lambdoid suture
Occipital bone
F. Netter M.D.

See also Plate 19


Maxillary bone
Incisive fossa
Palatine process
Intermaxillary suture
Zygomatic process
Zygomatic bone
Frontal bone
Sphenoid bone
Pterygoid process
Hamulus
Medial plate
Pterygoid fossa
Lateral plate
Scaphoid fossa
Greater wing
Foramen ovale
Foramen spinosum
Spine
Temporal bone
Zygomatic process
Articular tubercle
Mandibular fossa
Styloid process
Petrotympanic fissure
Carotid canal (external opening)
Inferior tympanic canaliculus
External acoustic meatus
Mastoid canaliculus
Mastoid process
Stylomastoid foramen
Petrous part
Mastoid notch
Groove for occipital artery
Jugular fossa
(jugular foramen in its depth)
Mastoid foramen
Parietal bone
Occipital bone
Hypoglossal canal
Occipital condyle
Condylar canal and fossa
Basilar part
Pharyngeal tubercle
Foramen magnum
Inferior nuchal line
External occipital crest
Superior nuchal line
External occipital protuberance
Palatomaxillary suture
Palatine bone
Horizontal plate
Greater palatine foramen
Pyramidal process
Lesser palatine foramina
Posterior nasal spine
Choanae
Vomer
Ala
Groove for auditory
tube (eustachian)
Foramen lacerum

Cranial Base: Superior View

See also Plates 20, 115


Frontal bone
Groove for superior sagittal sinus
Frontal crest
Groove for anterior meningeal vessels
Foramen cecum
Superior surface of orbital part
Ethmoid bone
Crista galli
Cribriform plate
Sphenoid bone
Lesser wing
Anterior clinoid process
Greater wing
Groove for middle meningeal vessels (frontal branches)
Body
Yoke
Prechiasmatic groove
Sella turcica
Tuberculum sellae
Hypophyseal fossa
Dorsum sellae
Posterior clinoid process
Carotid groove (for int. carotid a.)
Clivus
Temporal bone
Squamous part
Petrous part
Groove for lesser petrosal nerve
Groove for greater petrosal nerve
Arcuate eminence
Trigeminal impression
Groove for superior petrosal sinus
Groove for sigmoid sinus
Parietal bone
Groove for middle meningeal vessels (parietal branches)
Mastoid angle
Occipital bone
Clivus
Groove for inferior petrosal sinus
Basilar part
Groove for posterior meningeal vessels
Condyle
Groove for transverse sinus
Groove for occipital sinus
Internal occipital crest
Internal occipital protuberance
Groove for superior sagittal sinus
Anterior cranial fossa
Middle cranial fossa
Posterior cranial fossa
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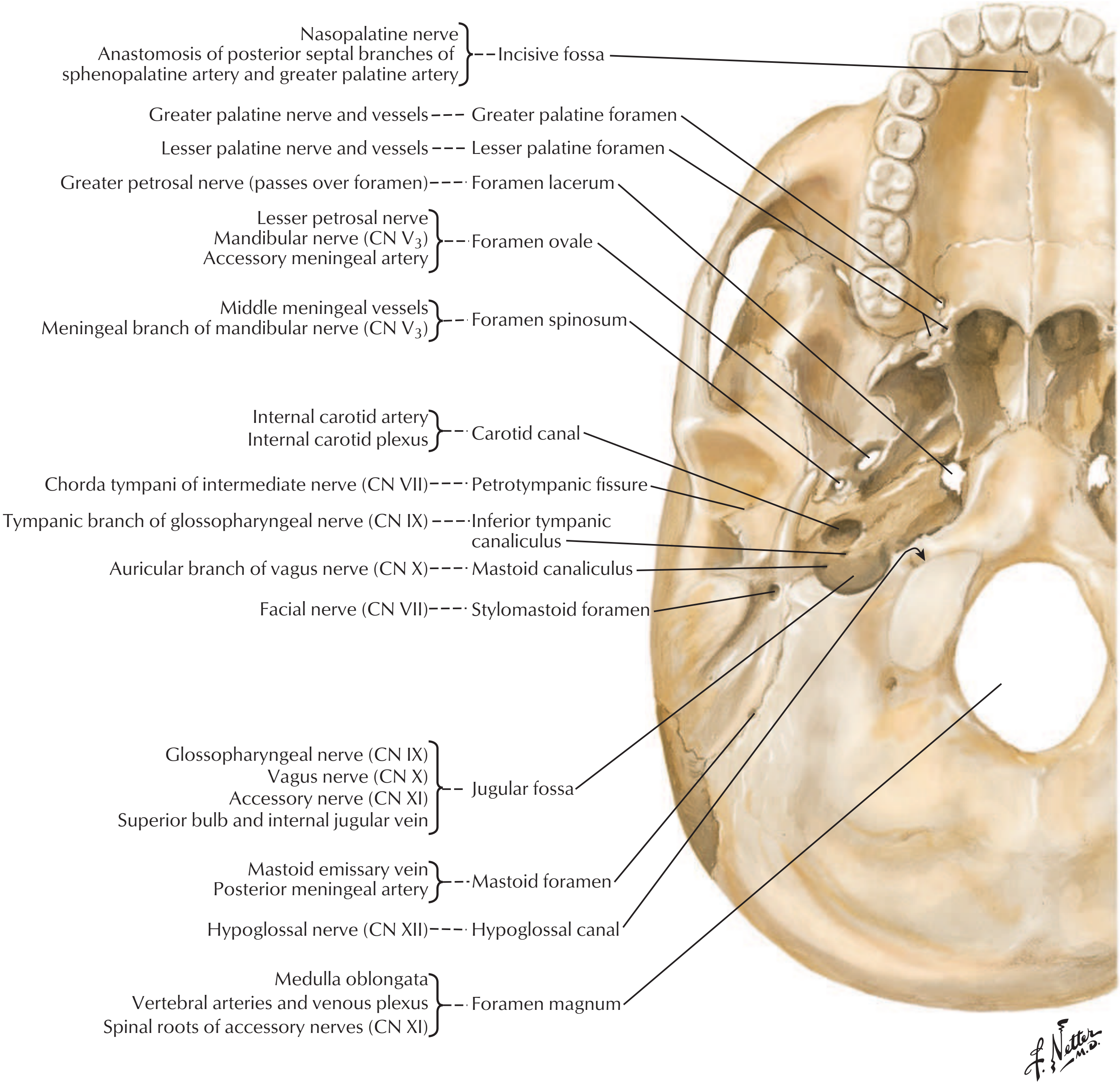
Foramina and Canals of Cranial Base: Inferior View

See also **Plate 17**



Nasopalatine nerve
Anastomosis of posterior septal branches of sphenopalatine artery and greater palatine artery
Incisive fossa
Greater palatine nerve and vessels
Greater palatine foramen
Lesser palatine nerve and vessels
Lesser palatine foramen
Greater petrosal nerve (passes over foramen)
Foramen lacerum
Lesser petrosal nerve
Mandibular nerve (CN V$_3$)
Accessory meningeal artery
Foramen ovale
Middle meningeal vessels
Meningeal branch of mandibular nerve (CN V$_3$)
Foramen spinosum
Internal carotid artery
Internal carotid plexus
Carotid canal
Chorda tympani of intermediate nerve (CN VII)
Petrotympanic fissure
Tympanic branch of glossopharyngeal nerve (CN IX)
Inferior tympanic canaliculus
Auricular branch of vagus nerve (CN X)
Mastoid canaliculus
Facial nerve (CN VII)
Stylomastoid foramen
Glossopharyngeal nerve (CN IX)
Vagus nerve (CN X)
Accessory nerve (CN XI)
Superior bulb and internal jugular vein
Jugular fossa
Mastoid emissary vein
Posterior meningeal artery
Mastoid foramen
Hypoglossal nerve (CN XII)
Hypoglossal canal
Medulla oblongata
Vertebral arteries and venous plexus
Spinal roots of accessory nerves (CN XI)
Foramen magnum
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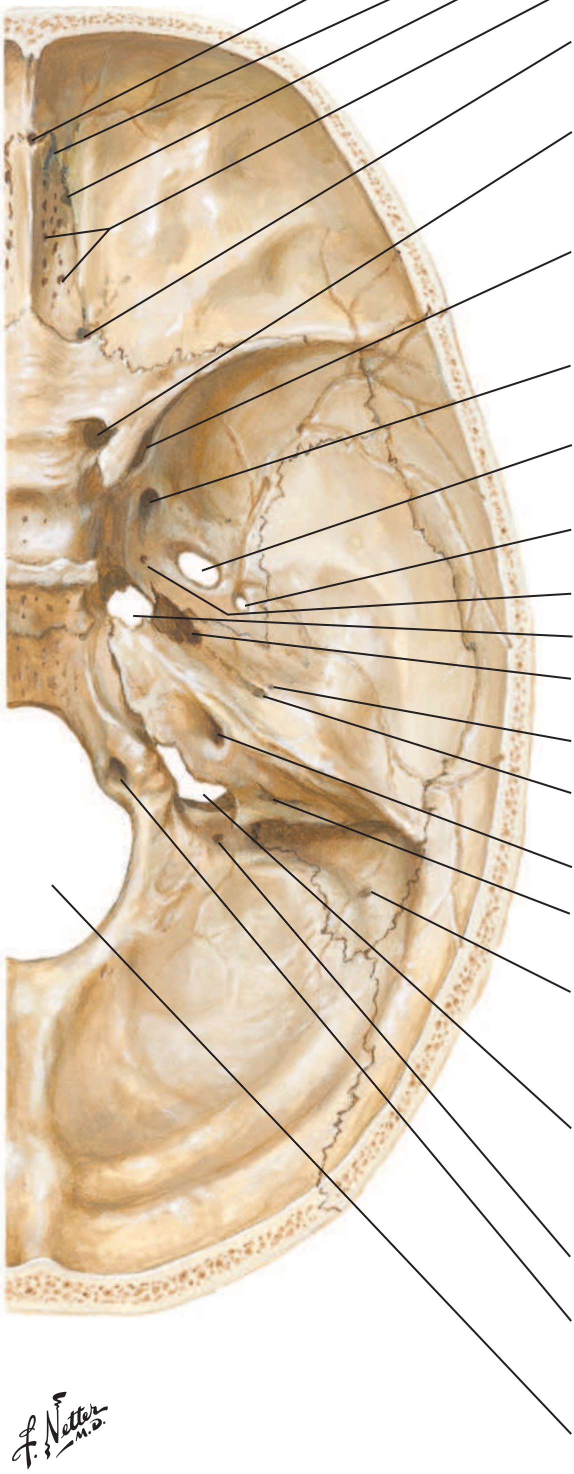
Foramina and Canals of Cranial Base: Superior View

See also Plates 18, 115



Foramen cecum	Emissary vein to superior sagittal sinus
Nasal slit Anterior ethmoidal foramen	Anterior ethmoidal artery, vein, and nerve
Foramina of cribriform plate	Olfactory nerves (CN I)
Posterior ethmoidal foramen	Posterior ethmoidal artery, vein, and nerve
Optic canal	Optic nerve (CN II) Ophthalmic artery
Superior orbital fissure	Oculomotor nerve (CN III) Trochlear nerve (CN IV) Lacrimal, frontal, and nasociliary branches of ophthalmic nerve (CN V_1) Abducens nerve (CN VI) Superior ophthalmic vein
Foramen rotundum	Maxillary nerve (CN V_2)
Foramen ovale	Mandibular nerve (CN V_3) Accessory meningeal artery Lesser petrosal nerve
Foramen spinosum	Middle meningeal artery and vein Meningeal branch of mandibular nerve
Sphenoidal emissary foramen (of Vesalius) (inconstant)	
Foramen lacerum	Greater petrosal nerve (passes over foramen)
Carotid canal	Internal carotid artery Internal carotid nerve plexus
Hiatus for	Lesser petrosal nerve
Hiatus for	Greater petrosal nerve
Internal acoustic meatus	Facial nerve (CN VII) Vestibulocochlear nerve (CN VIII) Labyrinthine artery
Opening of vestibular aqueduct	Endolymphatic duct
Mastoid foramen (inconstant)	Emissary vein (and occasional branch of occipital artery)
Jugular foramen	Inferior petrosal sinus Glossopharyngeal nerve (CN IX) Vagus nerve (CN X) Accessory nerve (CN XI) Sigmoid sinus Posterior meningeal artery
Condylar canal (inconstant)	Emissary vein and meningeal branch of ascending pharyngeal artery
Hypoglossal canal	Hypoglossal nerve (CN XII)
Foramen magnum	Medulla oblongata Meninges Vertebral arteries and venous plexus Meningeal branches of vertebral arteries Spinal roots of accessory nerves

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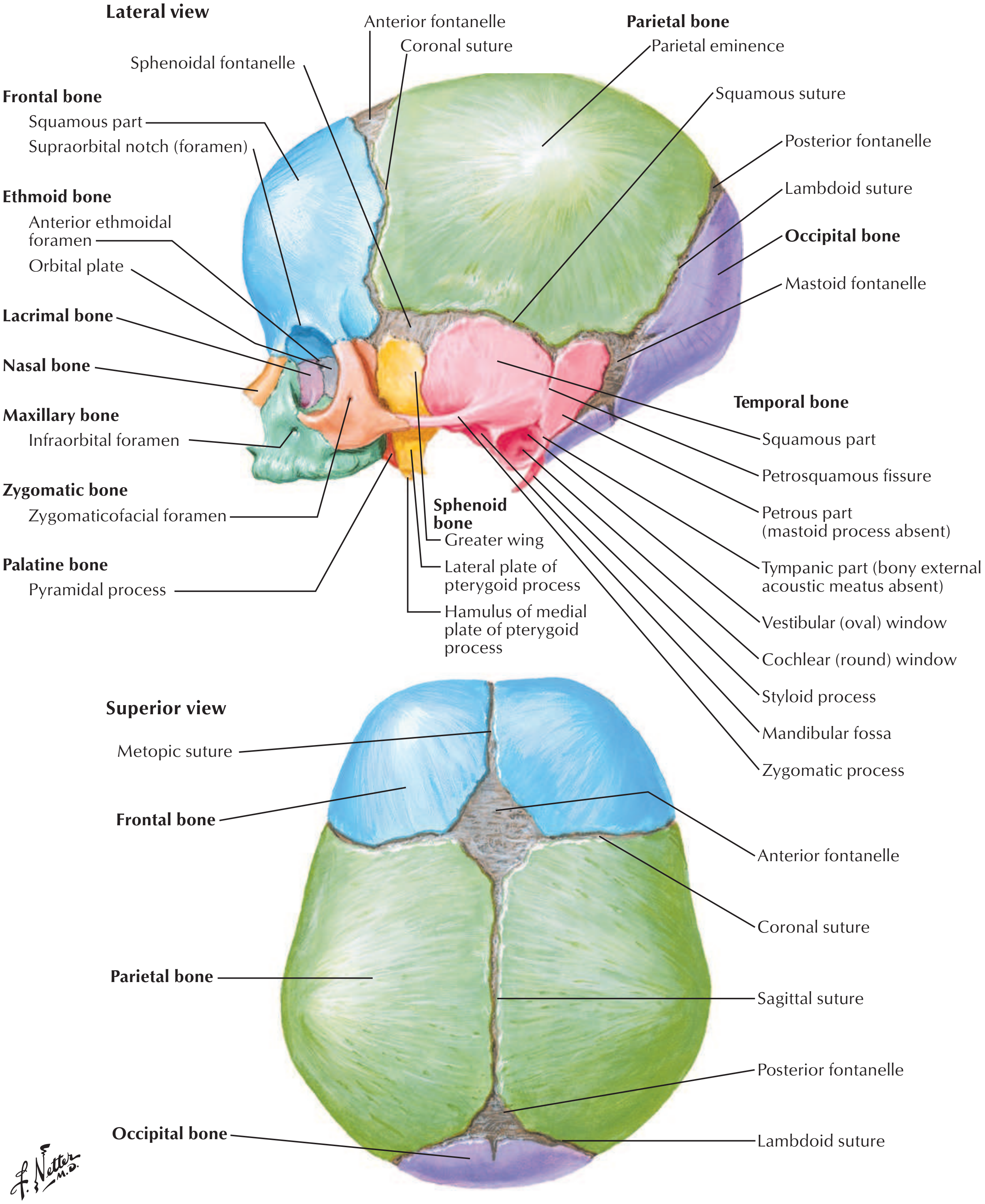
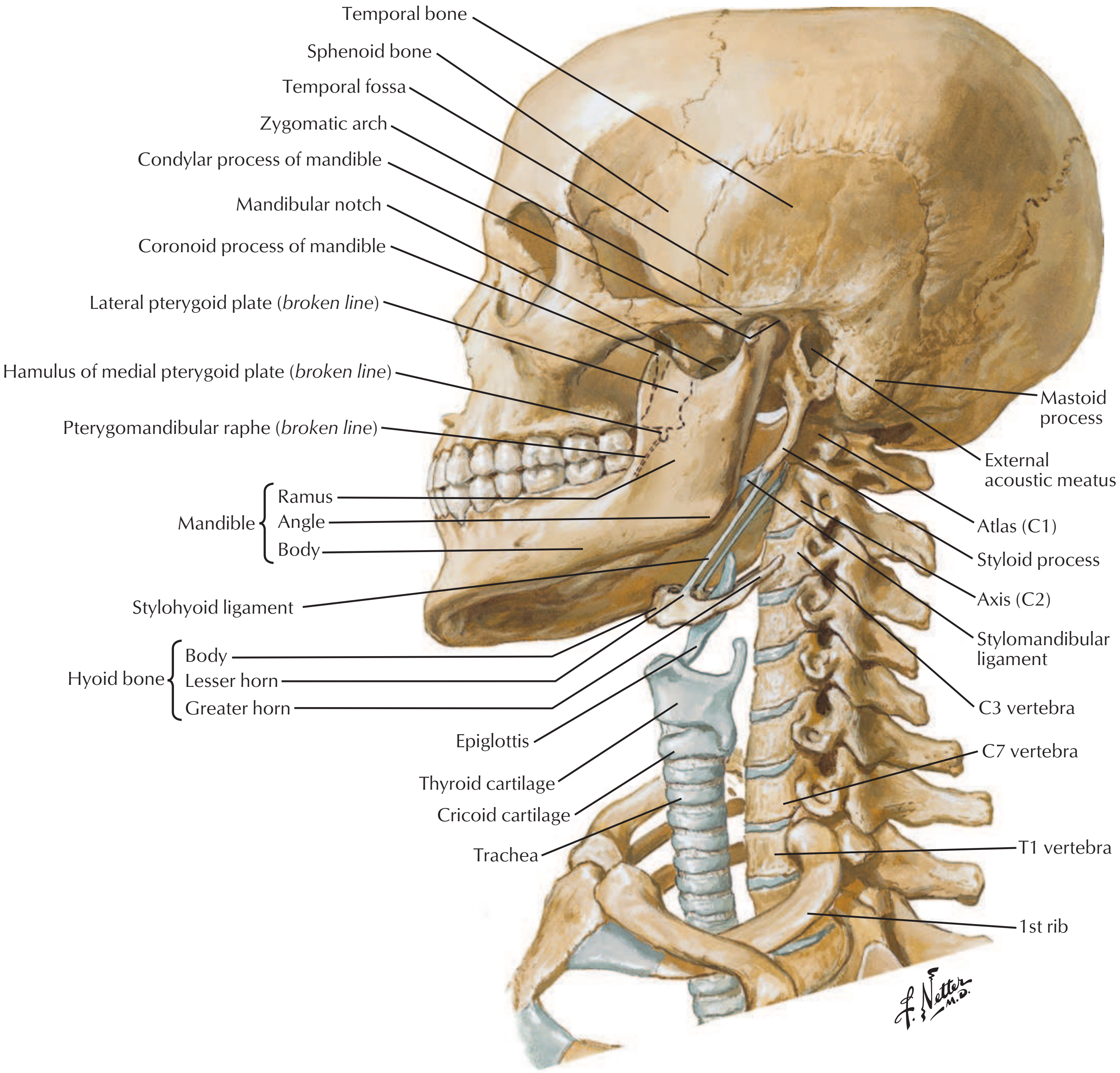
See also Plates 13, 16


Lateral view
Anterior fontanelle
Coronal suture
Parietal bone
Parietal eminence
Sphenoidal fontanelle
Frontal bone
Squamous part
Supraorbital notch (foramen)
Squamous suture
Posterior fontanelle
Lambdoid suture
Ethmoid bone
Anterior ethmoidal foramen
Orbital plate
Occipital bone
Mastoid fontanelle
Lacrimal bone
Nasal bone
Maxillary bone
Infraorbital foramen
Temporal bone
Squamous part
Petrosquamous fissure
Petrous part (mastoid process absent)
Tympanic part (bony external acoustic meatus absent)
Vestibular (oval) window
Cochlear (round) window
Styloid process
Mandibular fossa
Zygomatic process
Zygomatic bone
Zygomaticofacial foramen
Palatine bone
Pyramidal process
Sphenoid bone
Greater wing
Lateral plate of pterygoid process
Hamulus of medial plate of pterygoid process
Superior view
Metopic suture
Frontal bone
Anterior fontanelle
Coronal suture
Parietal bone
Sagittal suture
Posterior fontanelle
Lambdoid suture
Occipital bone


Temporal bone
Sphenoid bone
Temporal fossa
Zygomatic arch
Condylar process of mandible
Mandibular notch
Coronoid process of mandible
Lateral pterygoid plate (broken line)
Hamulus of medial pterygoid plate (broken line)
Pterygomandibular raphe (broken line)
Mandible
Ramus
Angle
Body
Stylohyoid ligament
Hyoid bone
Body
Lesser horn
Greater horn
Epiglottis
Thyroid cartilage
Cricoid cartilage
Trachea
Mastoid process
External acoustic meatus
Atlas (C1)
Styloid process
Axis (C2)
Stylomandibular ligament
C3 vertebra
C7 vertebra
T1 vertebra
1st rib
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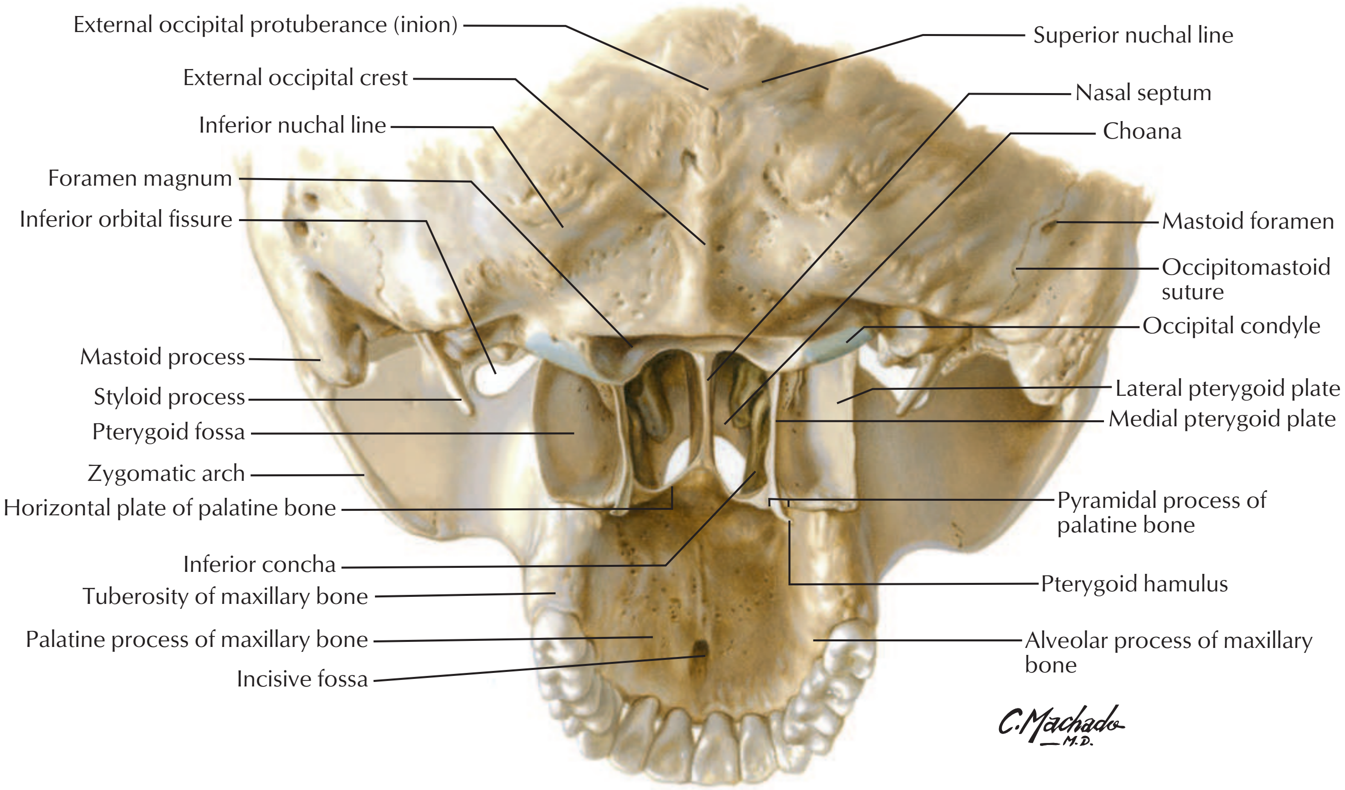
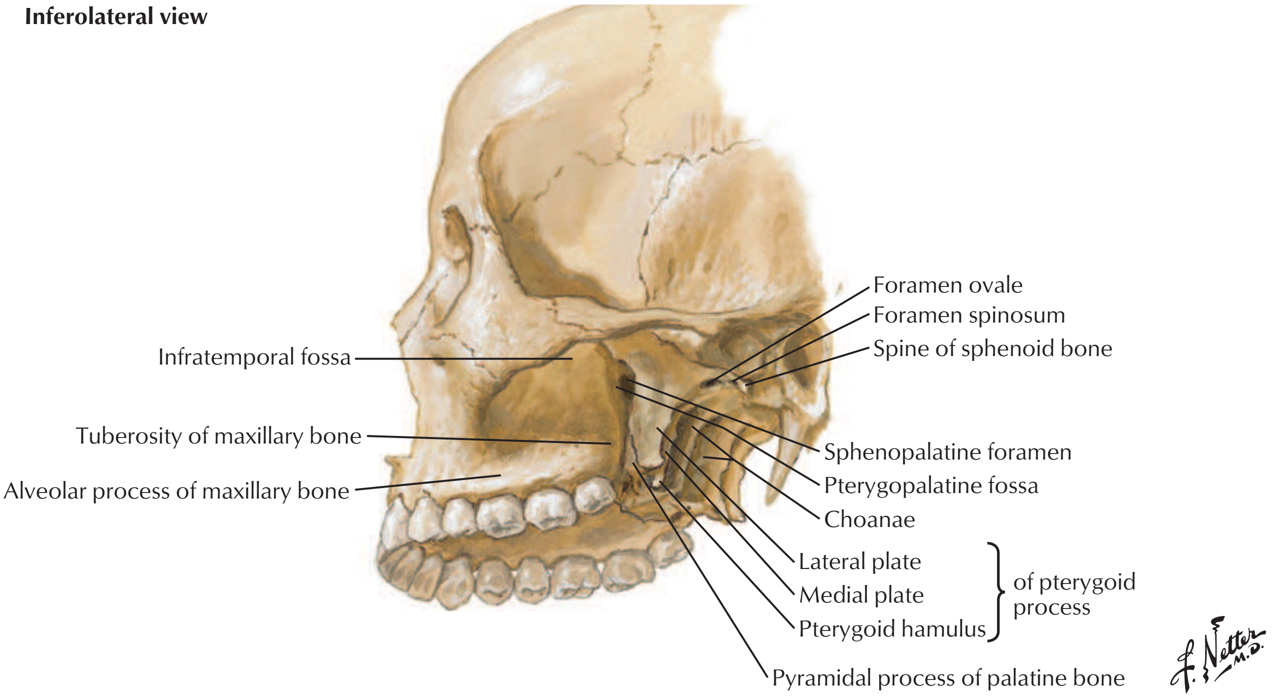
Pterygoid Fossae

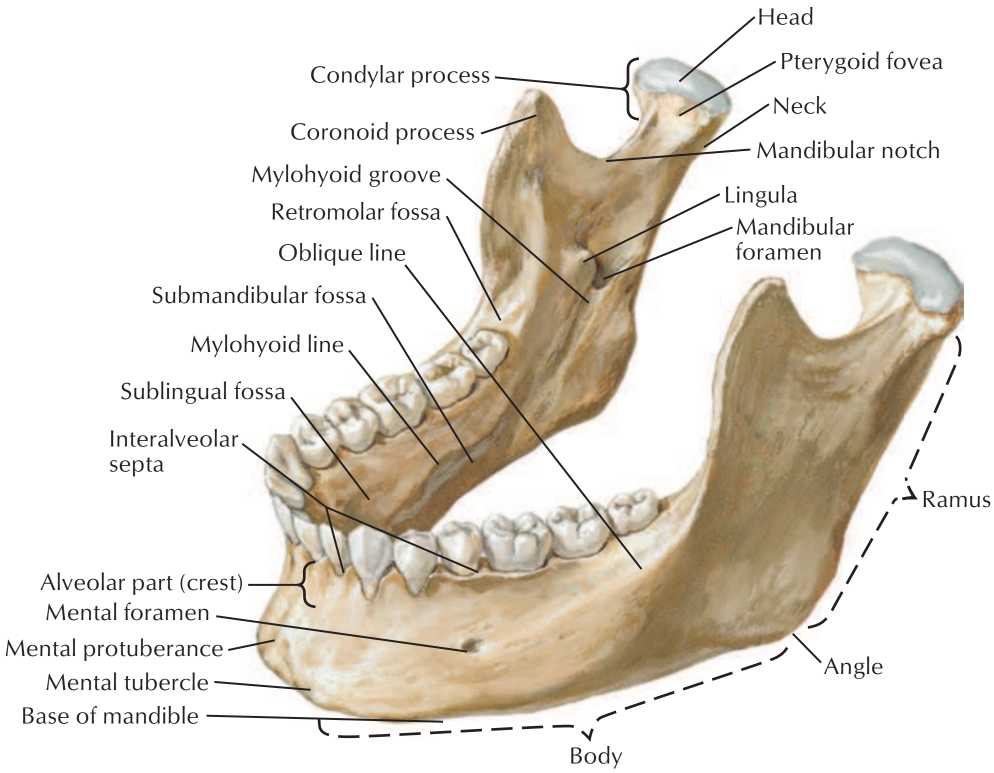
See also Plates 46, 47, 48

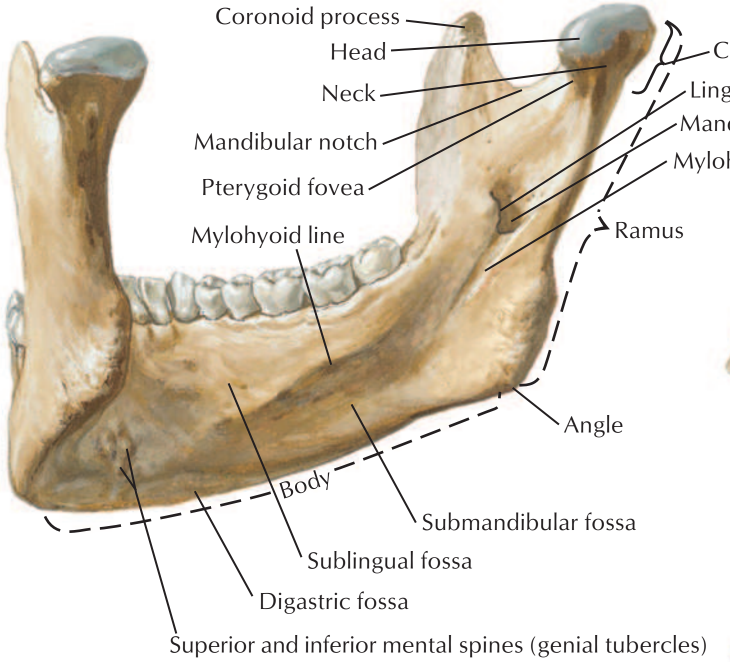
Posterior view

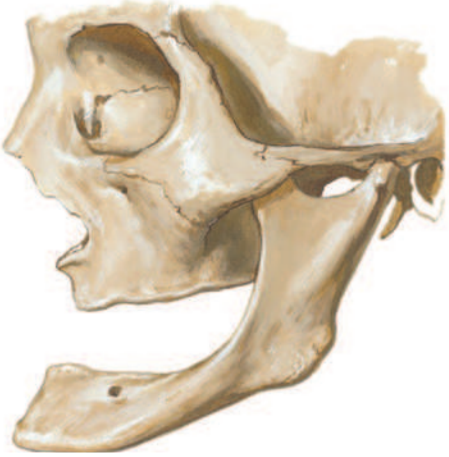

External occipital protuberance (inion)
External occipital crest
Inferior nuchal line
Foramen magnum
Inferior orbital fissure
Mastoid process
Styloid process
Pterygoid fossa
Zygomatic arch
Horizontal plate of palatine bone
Inferior concha
Tuberosity of maxillary bone
Palatine process of maxillary bone
Incisive fossa
Superior nuchal line
Nasal septum
Choana
Mastoid foramen
Occipitomastoid suture
Occipital condyle
Lateral pterygoid plate
Medial pterygoid plate
Pyramidal process of palatine bone
Pterygoid hamulus
Alveolar process of maxillary bone
C. Machado M.D.

Inferolateral view


Infratemporal fossa
Tuberosity of maxillary bone
Alveolar process of maxillary bone
Foramen ovale
Foramen spinosum
Spine of sphenoid bone
Sphenopalatine foramen
Pterygopalatine fossa
Choanae
Lateral plate
Medial plate
Pterygoid hamulus
of pterygoid process
Pyramidal process of palatine bone
F. Netter M.D.


Head
Pterygoid fovea
Condylar process
Neck
Coronoid process
Mandibular notch
Mylohyoid groove
Lingula
Retromolar fossa
Mandibular foramen
Oblique line
Submandibular fossa
Mylohyoid line
Sublingual fossa
Interalveolar septa
Ramus
Alveolar part (crest)
Mental foramen
Mental protuberance
Angle
Mental tubercle
Base of mandible
Body

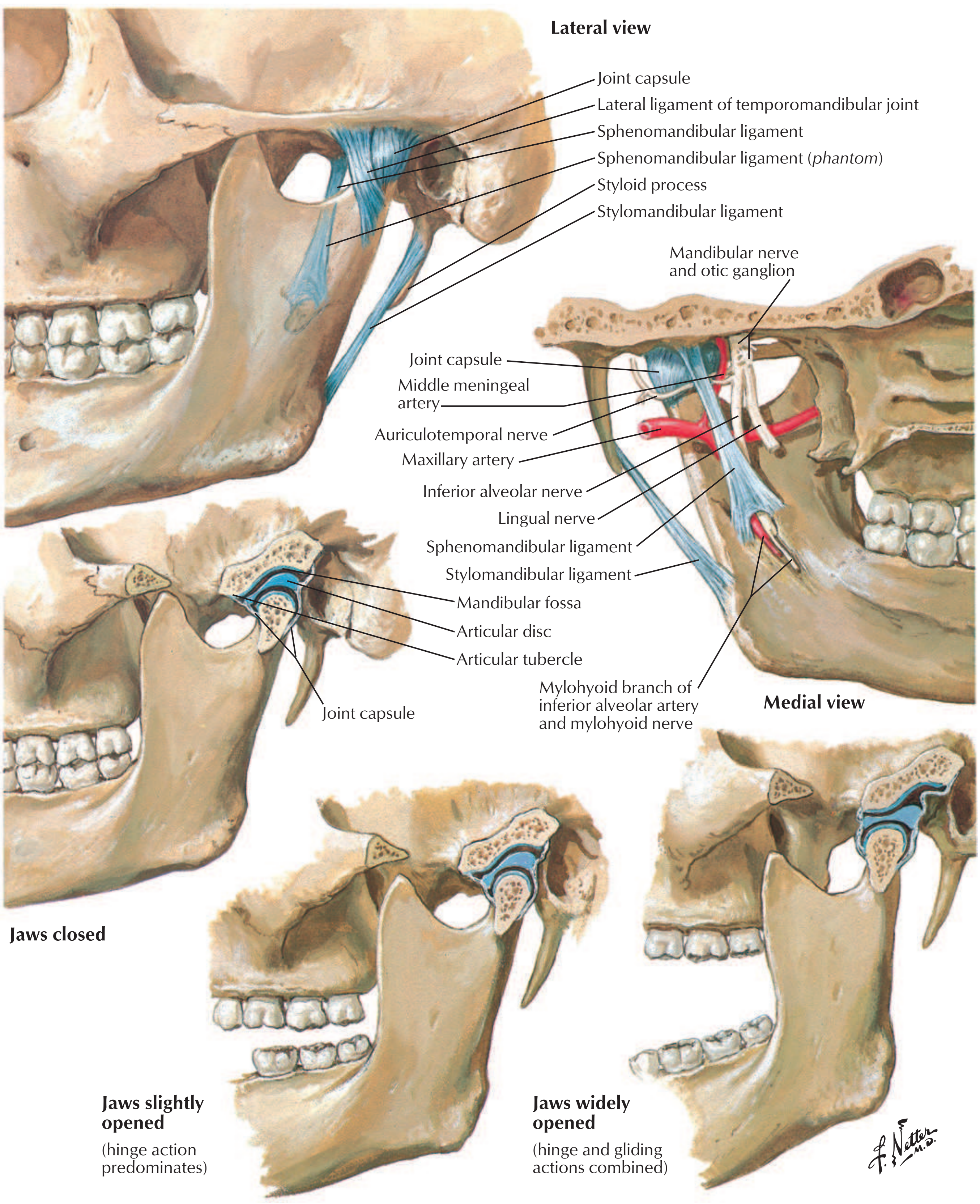

Coronoid process
Head
Condylar process
Neck
Lingula
Mandibular foramen
Mandibular notch
Mylohyoid groove
Pterygoid fovea
Ramus
Mylohyoid line
Angle
Body
Submandibular fossa
Sublingual fossa
Digastric fossa
Superior and inferior mental spines (genial tubercles)



Mandible of aged person (edentulous)

Temporomandibular Joint

See also Plate 56



Lateral view

Joint capsule
Lateral ligament of temporomandibular joint
Sphenomandibular ligament
Sphenomandibular ligament (*phantom*)
Styloid process
Stylomandibular ligament

Medial view

Mandibular nerve and otic ganglion
Joint capsule
Middle meningeal artery
Auriculotemporal nerve
Maxillary artery
Inferior alveolar nerve
Lingual nerve
Sphenomandibular ligament
Stylomandibular ligament
Mylohyoid branch of inferior alveolar artery and mylohyoid nerve

Jaws closed

Mandibular fossa
Articular disc
Articular tubercle
Joint capsule

Jaws slightly opened

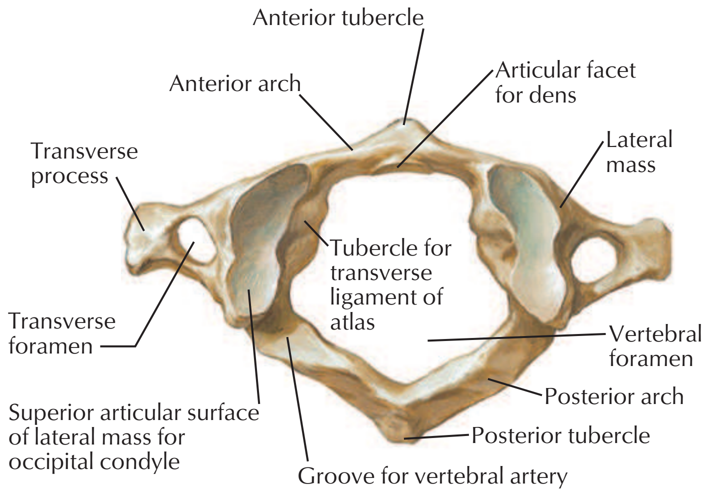
(hinge action predominates)

Jaws widely opened

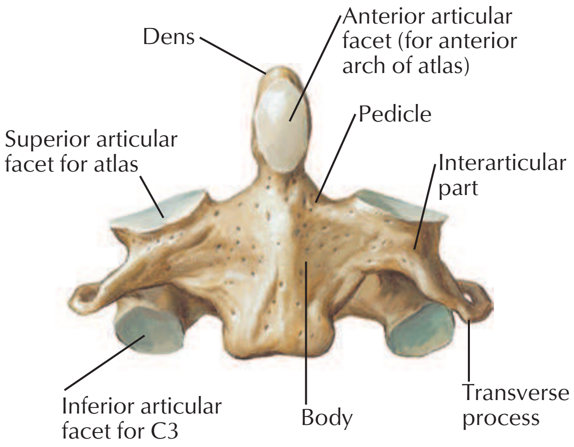
(hinge and gliding actions combined)

Cervical Vertebrae: Atlas and Axis

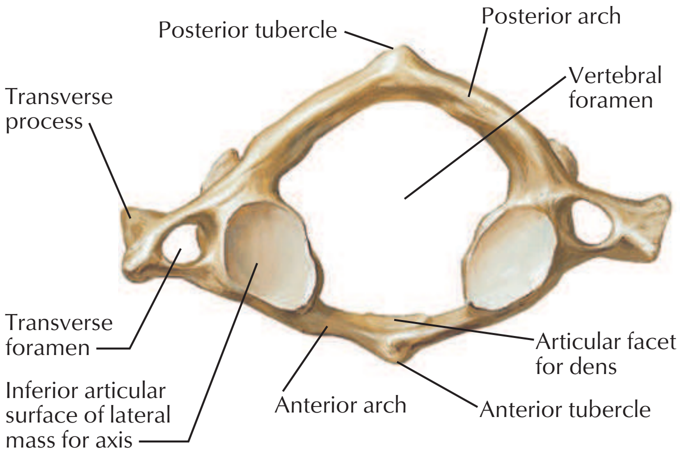
See also Plates 28, 30


Anterior tubercle
Anterior arch
Articular facet for dens
Transverse process
Lateral mass
Tubercle for transverse ligament of atlas
Transverse foramen
Vertebral foramen
Posterior arch
Superior articular surface of lateral mass for occipital condyle
Posterior tubercle
Groove for vertebral artery

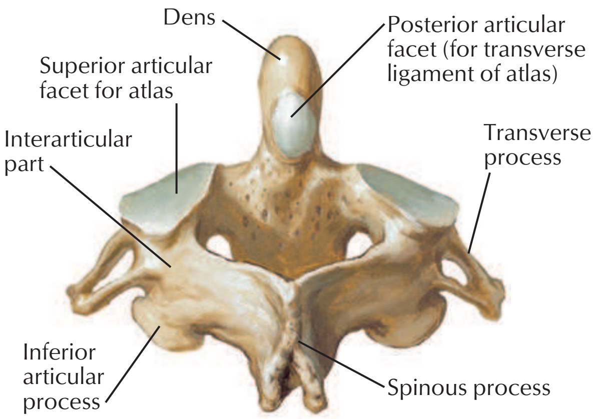
Atlas (C1): superior view


Dens
Anterior articular facet (for anterior arch of atlas)
Pedicle
Superior articular facet for atlas
Interarticular part
Inferior articular facet for C3
Body
Transverse process

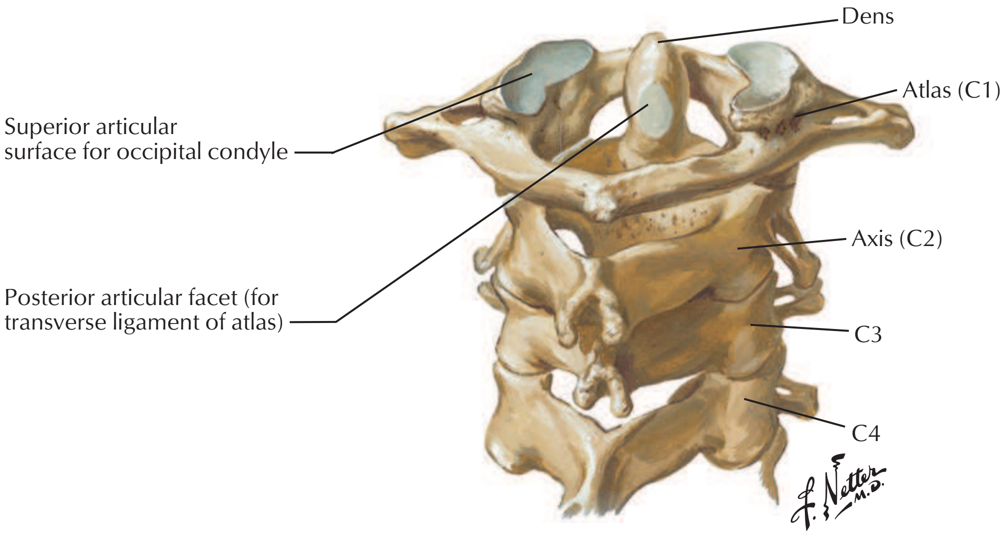
Axis (C2): anterior view


Posterior tubercle
Posterior arch
Vertebral foramen
Transverse process
Transverse foramen
Articular facet for dens
Inferior articular surface of lateral mass for axis
Anterior arch
Anterior tubercle

Atlas (C1): inferior view


Dens
Posterior articular facet (for transverse ligament of atlas)
Superior articular facet for atlas
Interarticular part
Transverse process
Inferior articular process
Spinous process

Axis (C2): posterosuperior view

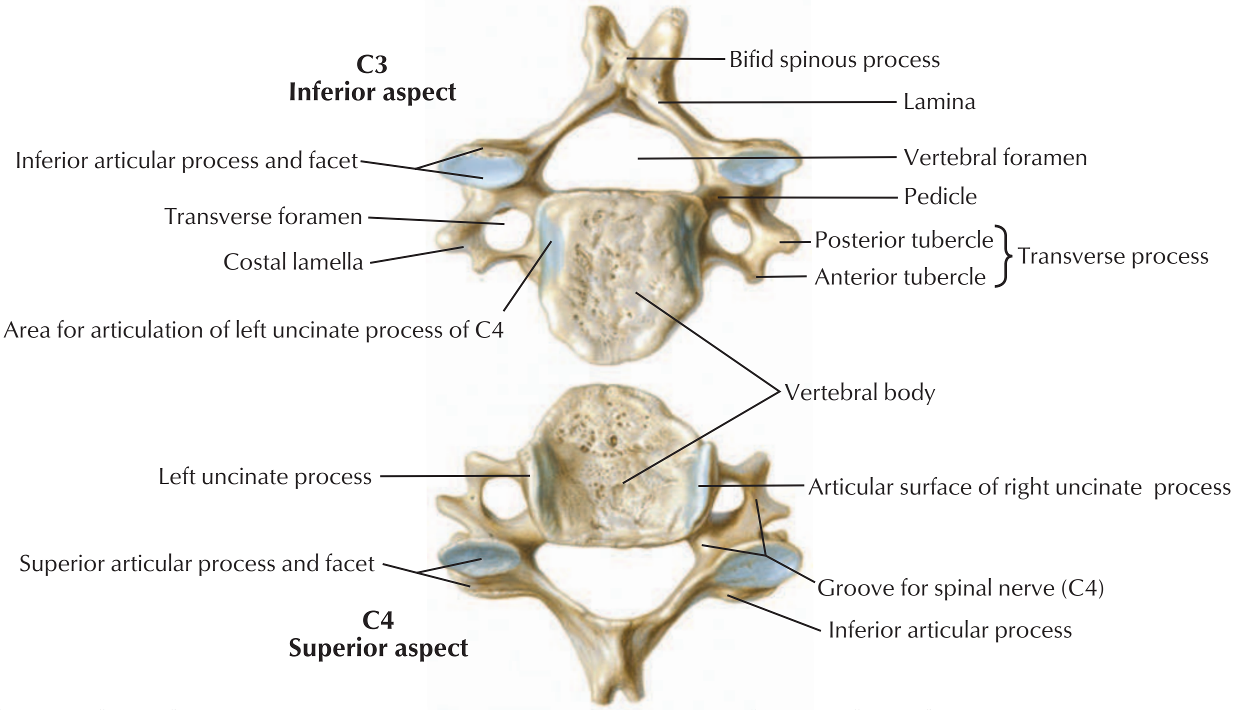

Dens
Atlas (C1)
Superior articular surface for occipital condyle
Axis (C2)
Posterior articular facet (for transverse ligament of atlas)
C3
C4

Upper cervical vertebrae, assembled: posterosuperior view

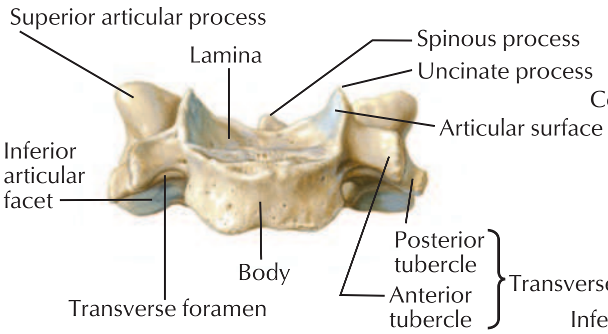
Cervical Vertebrae (continued)

See also Plates 28, 29

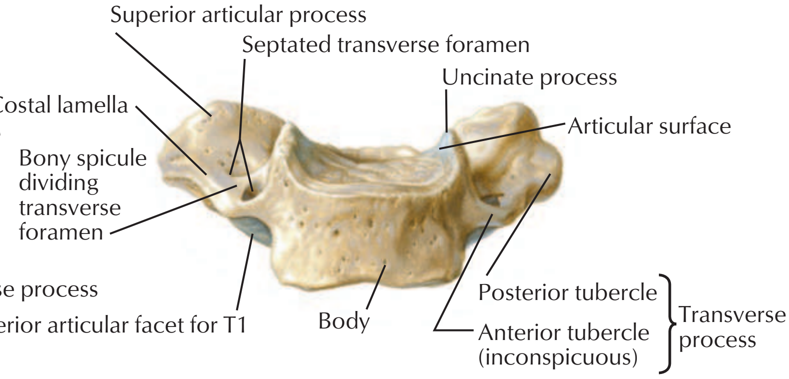
Inferior aspect of C3 and superior aspect of C4 showing the sites of the facet and uncovertebral articulations


C3
Inferior aspect
Bifid spinous process
Lamina
Inferior articular process and facet
Vertebral foramen
Pedicle
Transverse foramen
Posterior tubercle
Anterior tubercle
Transverse process
Costal lamella
Area for articulation of left uncinate process of C4
Vertebral body
Left uncinate process
Articular surface of right uncinate process
Superior articular process and facet
Groove for spinal nerve (C4)
Inferior articular process
C4
Superior aspect

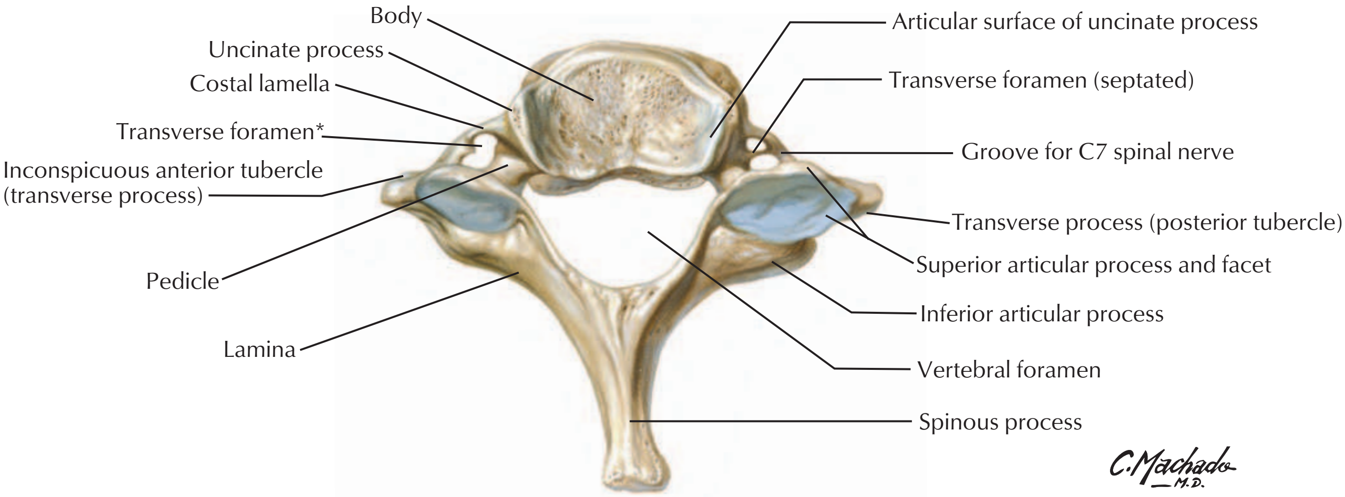
4th cervical vertebra: anterior view


Superior articular process
Lamina
Spinous process
Uncinate process
Articular surface
Inferior articular facet
Body
Transverse foramen
Posterior tubercle
Anterior tubercle
Transverse process

7th cervical vertebra: anterior view


Superior articular process
Septated transverse foramen
Uncinate process
Costal lamella
Articular surface
Bony spicule dividing transverse foramen
Inferior articular facet for T1
Body
Posterior tubercle
Anterior tubercle (inconspicuous)
Transverse process

7th cervical vertebra (vertebra prominens): superior view

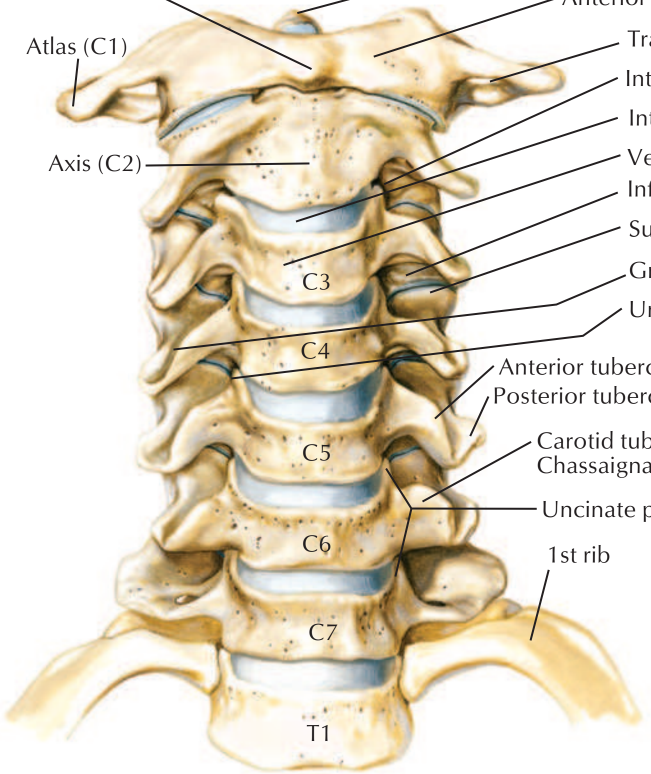

Body
Uncinate process
Costal lamella
Transverse foramen*
Inconspicuous anterior tubercle (transverse process)
Pedicle
Lamina
Articular surface of uncinate process
Transverse foramen (septated)
Groove for C7 spinal nerve
Transverse process (posterior tubercle)
Superior articular process and facet
Inferior articular process
Vertebral foramen
Spinous process
C.Machado M.D.

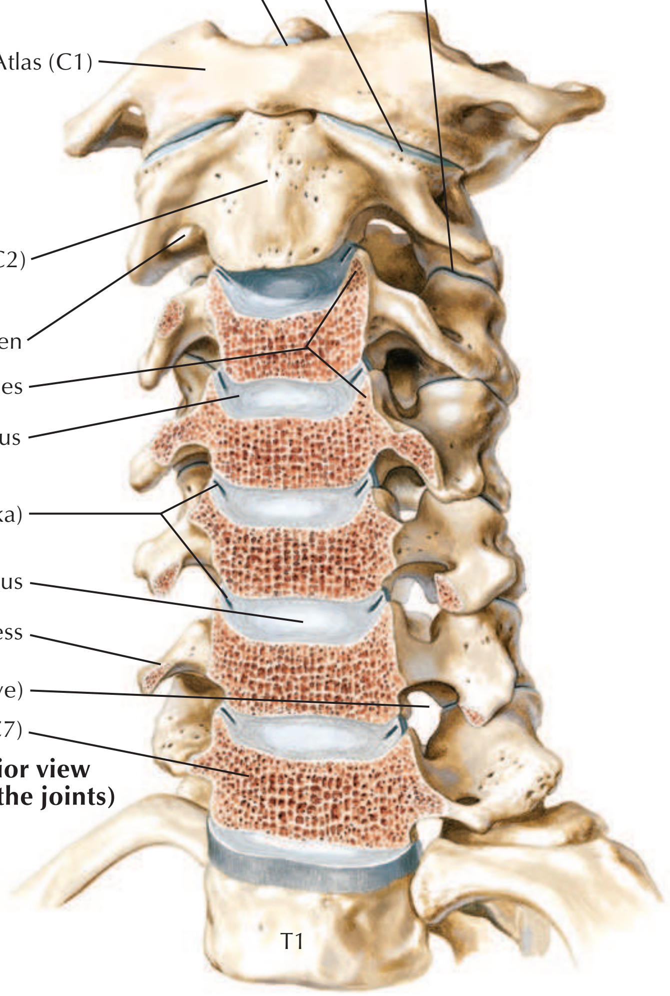
The foramina transversaria of C7 transmit vertebral veins, but usually not the vertebral artery, and are asymmetrical in this specimen.

Cervical Vertebrae: Uncovertebral Joints

See also Plate 29

Cervical vertebrae: anterior view


Dens of axis
Anterior tubercle of atlas
Anterior arch of atlas
Atlas (C1)
Transverse foramen
Intervertebral foramen (for C3 spinal nerve)
Intervertebral disc
Axis (C2)
Vertebral body
Inferior articular process (C3)
Superior articular process (C4)
C3
Groove for spinal nerve
Uncus
C4
Anterior tubercle
Posterior tubercle
Transverse process
C5
Carotid tubercle (of Chassaignac)
Uncinate processes
C6
1st rib
C7
T1


Articular cartilage on dens for median atlantoaxial joint
Lateral atlantoaxial joint
Facet (zygapophysial) joint between C2 and C3
Atlas (C1)
Axis (C2)
Transverse foramen
Uncinate processes
Anulus fibrosus
Uncovertebral joints (clefts of Luschka)
Nucleus pulposus
Transverse process
Intervertebral foramen (for C7 spinal nerve)
Vertebral body (C7)
T1

The uncovertebral joints of the cervical spine: anterior view (C3 to C7 have been sectioned coronally to expose the joints)

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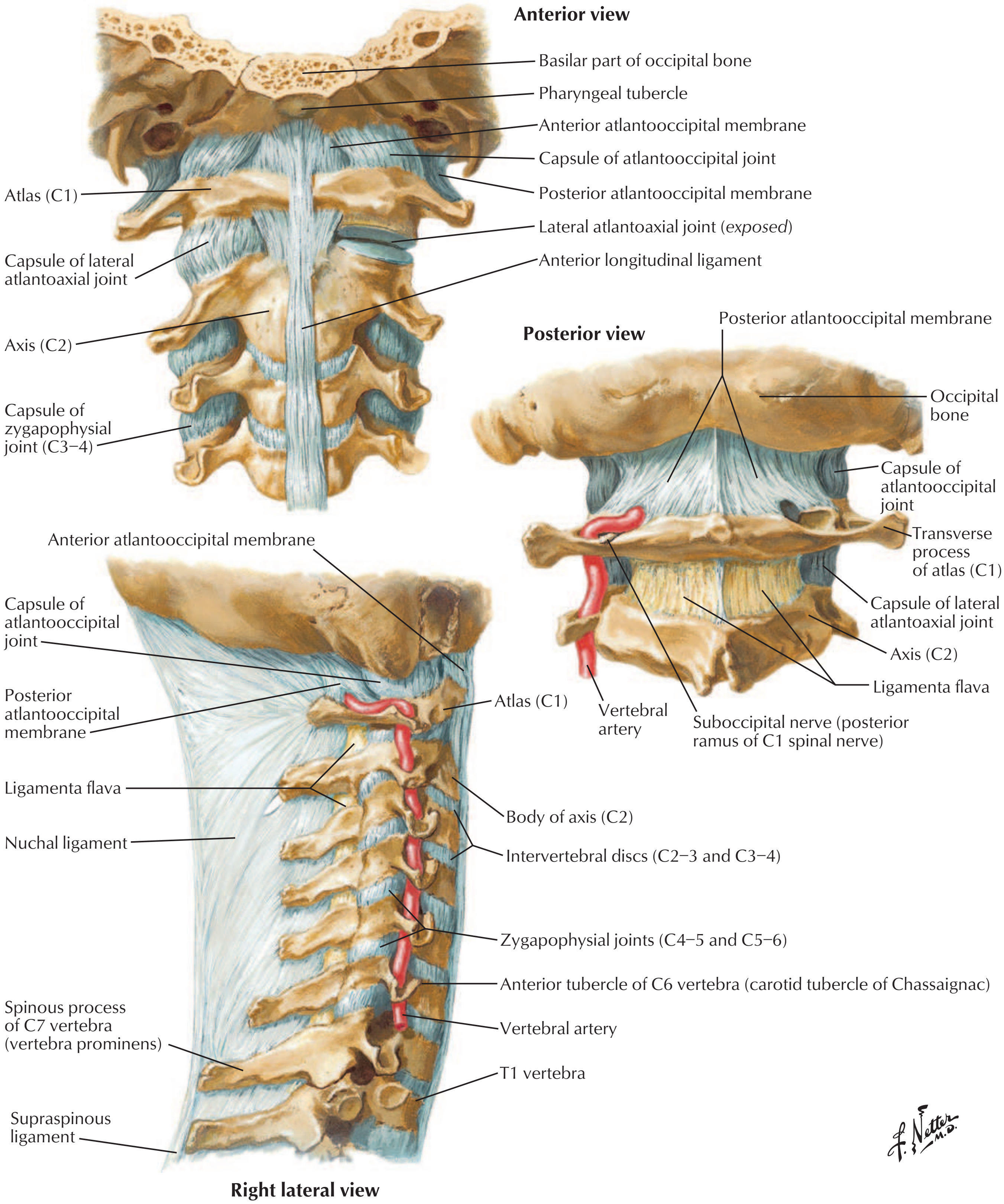
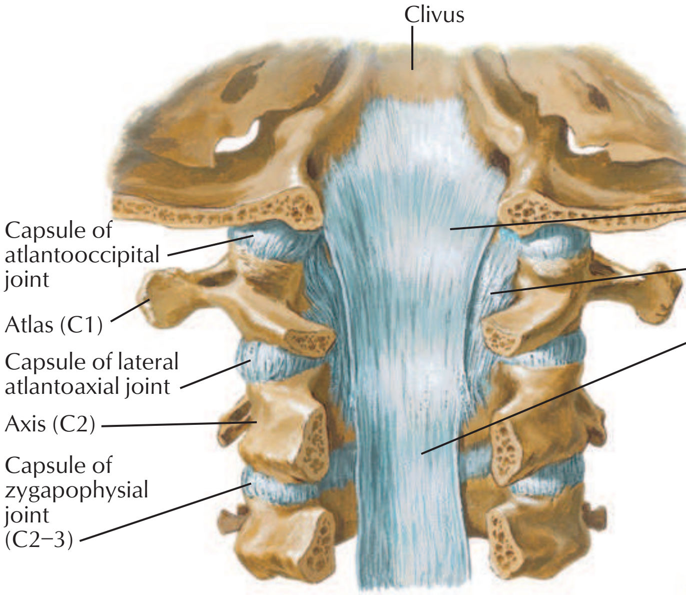
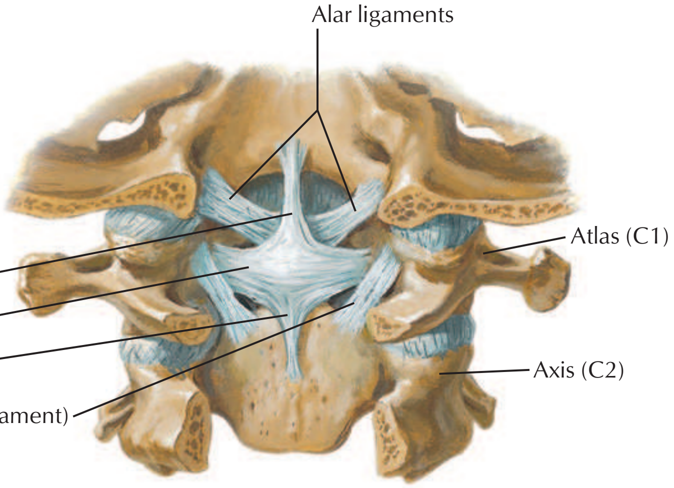
External Craniocervical Ligaments


Anterior view
Basilar part of occipital bone
Pharyngeal tubercle
Anterior atlantooccipital membrane
Capsule of atlantooccipital joint
Posterior atlantooccipital membrane
Lateral atlantoaxial joint (*exposed*)
Anterior longitudinal ligament
Atlas (C1)
Capsule of lateral atlantoaxial joint
Axis (C2)
Capsule of zygapophysial joint (C3–4)
Posterior view
Posterior atlantooccipital membrane
Occipital bone
Capsule of atlantooccipital joint
Transverse process of atlas (C1)
Capsule of lateral atlantoaxial joint
Axis (C2)
Ligamenta flava
Vertebral artery
Suboccipital nerve (posterior ramus of C1 spinal nerve)
Anterior atlantooccipital membrane
Capsule of atlantooccipital joint
Posterior atlantooccipital membrane
Ligamenta flava
Nuchal ligament
Atlas (C1)
Body of axis (C2)
Intervertebral discs (C2–3 and C3–4)
Zygapophysial joints (C4–5 and C5–6)
Anterior tubercle of C6 vertebra (carotid tubercle of Chassaignac)
Vertebral artery
T1 vertebra
Spinous process of C7 vertebra (vertebra prominens)
Supraspinous ligament
Right lateral view

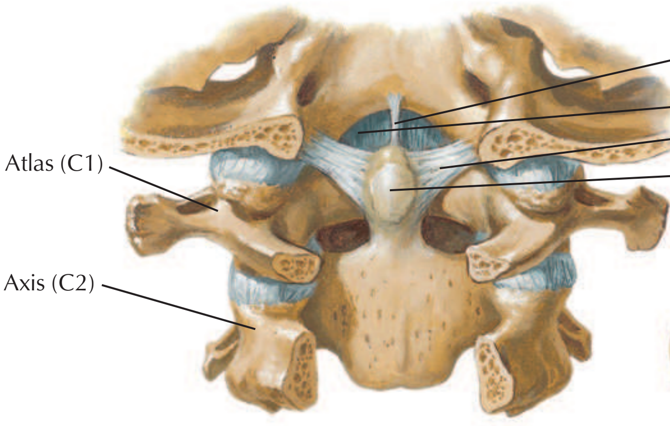
See also Plate 26

Upper part of vertebral canal with spinous processes and parts of vertebral arches removed to expose ligaments on posterior vertebral bodies: posterior view

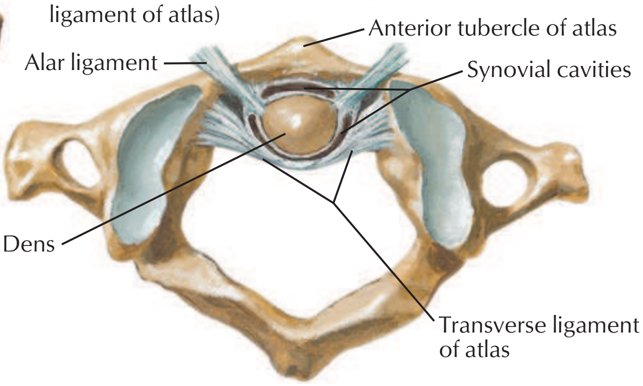

Clivus
Tectorial membrane
Capsule of atlantooccipital joint
Deeper (accessory) part of tectorial membrane (atlantoaxial ligament)
Atlas (C1)
Posterior longitudinal ligament
Capsule of lateral atlantoaxial joint
Axis (C2)
Capsule of zygapophysial joint (C2–3)


Alar ligaments
Atlas (C1)
Cruciate ligament
Superior longitudinal band
Transverse ligament of atlas
Inferior longitudinal band
Axis (C2)
Deeper (accessory) part of tectorial membrane (atlantoaxial ligament)

Principal part of tectorial membrane removed to expose deeper ligaments: posterior view


Apical ligament of dens
Anterior atlantooccipital ligament
Alar ligament
Atlas (C1)
Posterior articular facet of dens (for transverse ligament of atlas)
Axis (C2)

Cruciate ligament removed to show deeper ligaments: posterior view

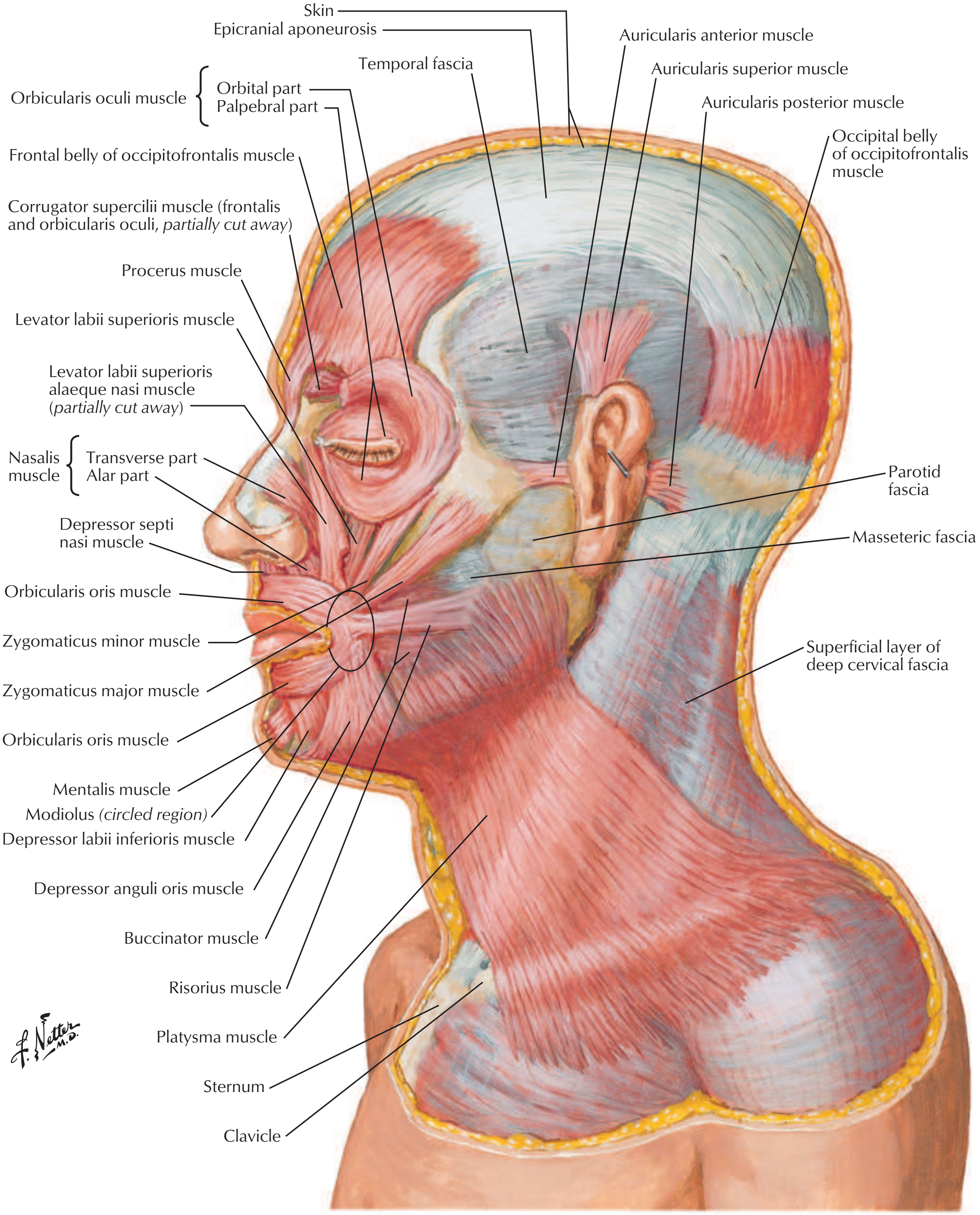

Anterior tubercle of atlas
Alar ligament
Synovial cavities
Dens
Transverse ligament of atlas

Median atlantoaxial joint: superior view

F. Netter M.D.

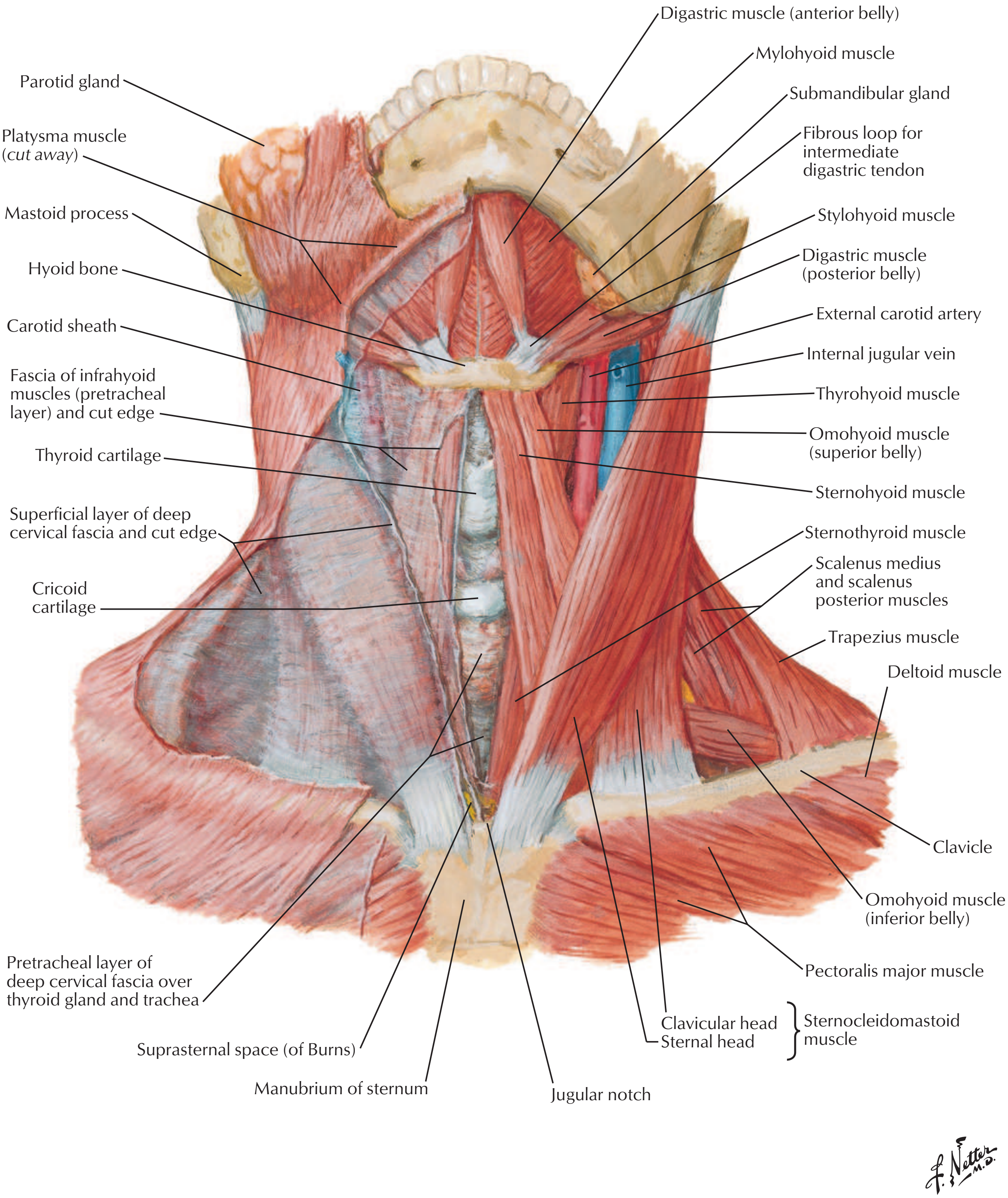
Muscles of Facial Expression: Lateral View

See also **Plates 34**, **55**, **56**


Skin
Epicranial aponeurosis
Temporal fascia
Auricularis anterior muscle
Auricularis superior muscle
Auricularis posterior muscle
Occipital belly of occipitofrontalis muscle
Orbicularis oculi muscle
Orbital part
Palpebral part
Frontal belly of occipitofrontalis muscle
Corrugator supercilii muscle (frontalis and orbicularis oculi, *partially cut away*)
Procerus muscle
Levator labii superioris muscle
Levator labii superioris alaeque nasi muscle (*partially cut away*)
Nasalis muscle
Transverse part
Alar part
Depressor septi nasi muscle
Orbicularis oris muscle
Zygomaticus minor muscle
Zygomaticus major muscle
Orbicularis oris muscle
Mentalis muscle
Modiolus *(circled region)*
Depressor labii inferioris muscle
Depressor anguli oris muscle
Buccinator muscle
Risorius muscle
Platysma muscle
Sternum
Clavicle
Parotid fascia
Masseteric fascia
Superficial layer of deep cervical fascia

Muscles of Neck: Anterior View

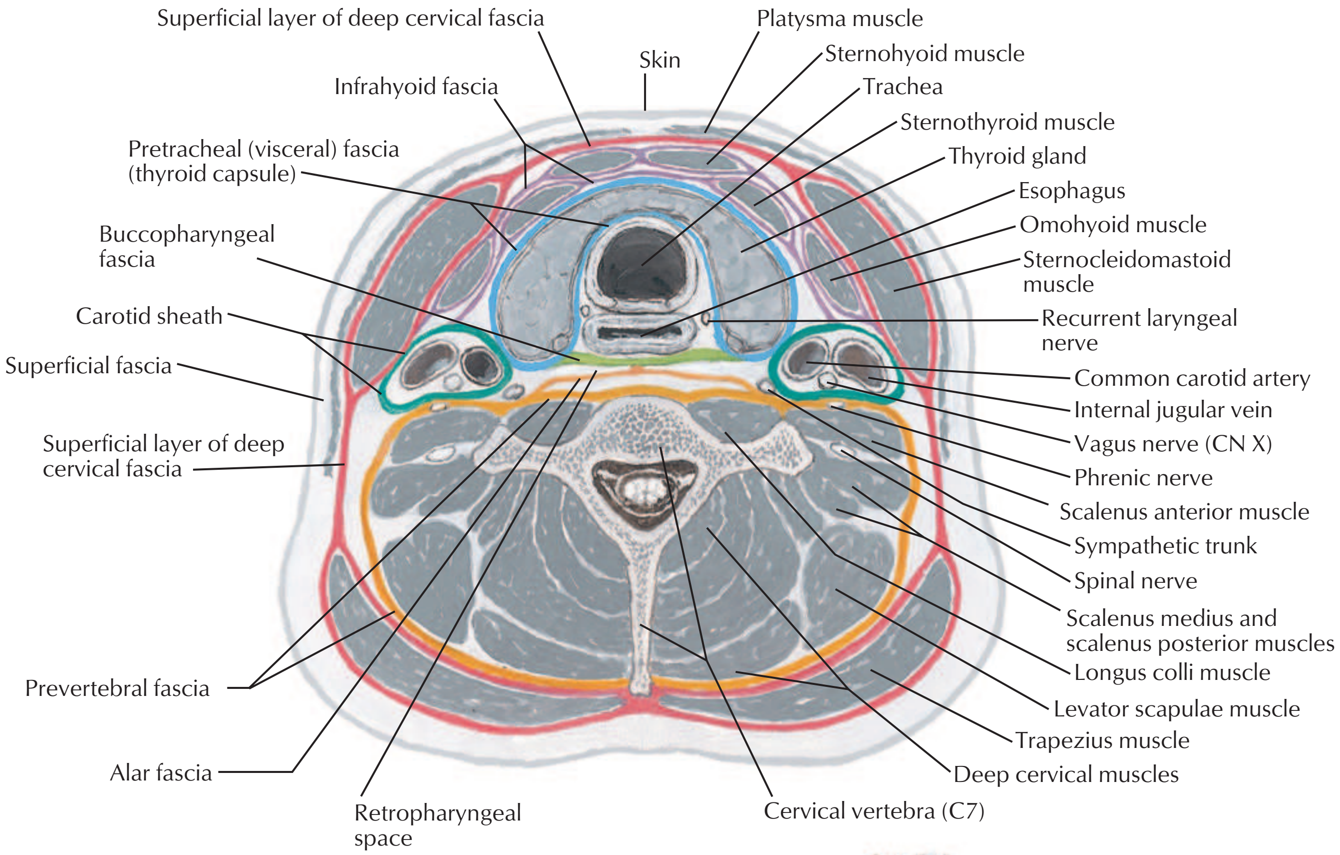
See also Plates 33, 35, 38


Digastric muscle (anterior belly)
Mylohyoid muscle
Submandibular gland
Fibrous loop for intermediate digastric tendon
Stylohyoid muscle
Digastric muscle (posterior belly)
External carotid artery
Internal jugular vein
Thyrohyoid muscle
Omohyoid muscle (superior belly)
Sternohyoid muscle
Sternothyroid muscle
Scalenus medius and scalenus posterior muscles
Trapezius muscle
Deltoid muscle
Clavicle
Omohyoid muscle (inferior belly)
Pectoralis major muscle
Clavicular head
Sternal head
Sternocleidomastoid muscle
Jugular notch
Manubrium of sternum
Suprasternal space (of Burns)
Pretracheal layer of deep cervical fascia over thyroid gland and trachea
Cricoid cartilage
Superficial layer of deep cervical fascia and cut edge
Thyroid cartilage
Fascia of infrahyoid muscles (pretracheal layer) and cut edge
Carotid sheath
Hyoid bone
Mastoid process
Platysma muscle (*cut away*)
Parotid gland
F. Netter M.D.

Fascial Layers of Neck

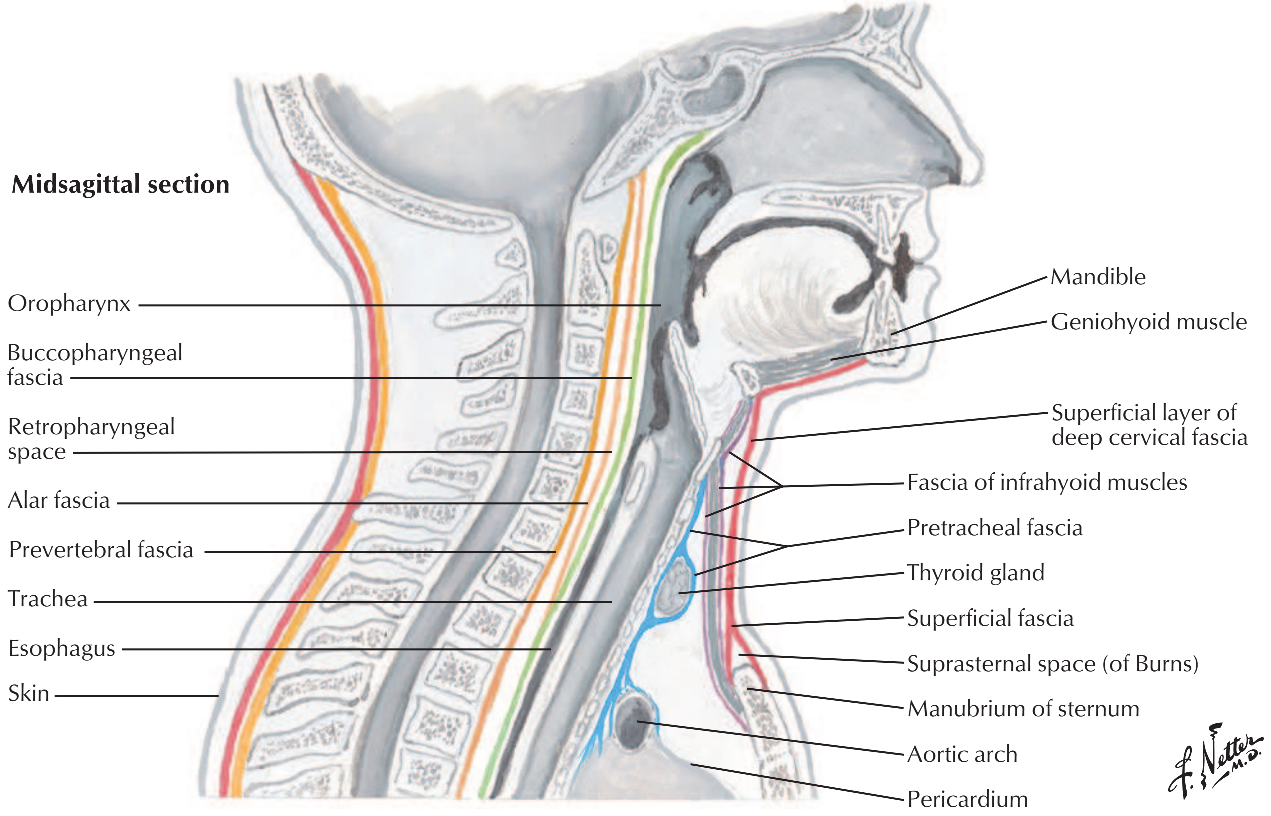
See also **Plate 32**

Cross section



Superficial layer of deep cervical fascia
Platysma muscle
Skin
Sternohyoid muscle
Infrahyoid fascia
Trachea
Sternothyroid muscle
Pretracheal (visceral) fascia (thyroid capsule)
Thyroid gland
Esophagus
Buccopharyngeal fascia
Omohyoid muscle
Sternocleidomastoid muscle
Carotid sheath
Recurrent laryngeal nerve
Superficial fascia
Common carotid artery
Internal jugular vein
Superficial layer of deep cervical fascia
Vagus nerve (CN X)
Phrenic nerve
Scalenus anterior muscle
Sympathetic trunk
Spinal nerve
Scalenus medius and scalenus posterior muscles
Prevertebral fascia
Longus colli muscle
Levator scapulae muscle
Trapezius muscle
Alar fascia
Deep cervical muscles
Retropharyngeal space
Cervical vertebra (C7)

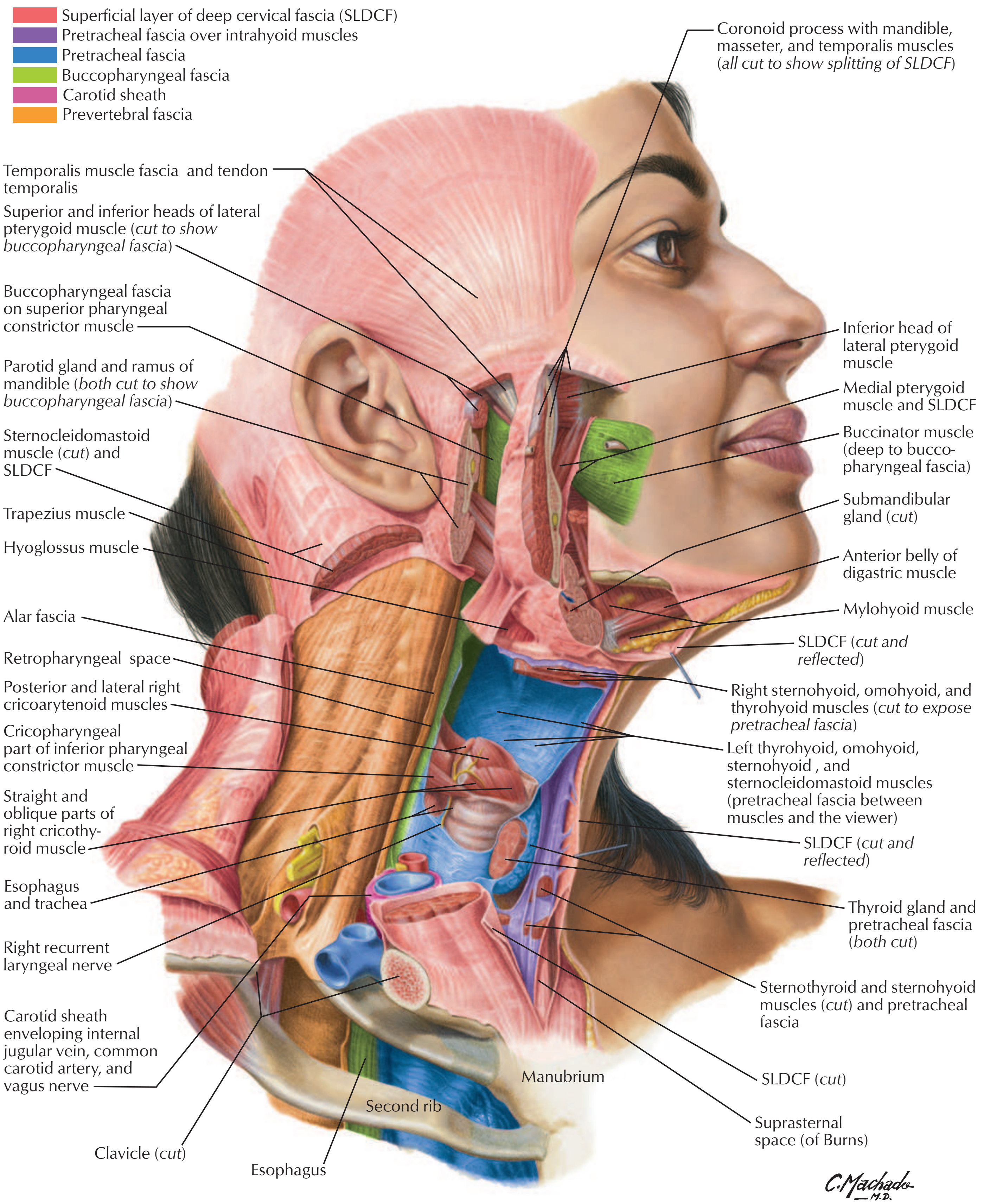
Midsagittal section



Mandible
Geniohyoid muscle
Oropharynx
Buccopharyngeal fascia
Superficial layer of deep cervical fascia
Retropharyngeal space
Fascia of infrahyoid muscles
Alar fascia
Pretracheal fascia
Prevertebral fascia
Thyroid gland
Trachea
Superficial fascia
Suprasternal space (of Burns)
Esophagus
Skin
Manubrium of sternum
Aortic arch
Pericardium

Cervical Fasciae

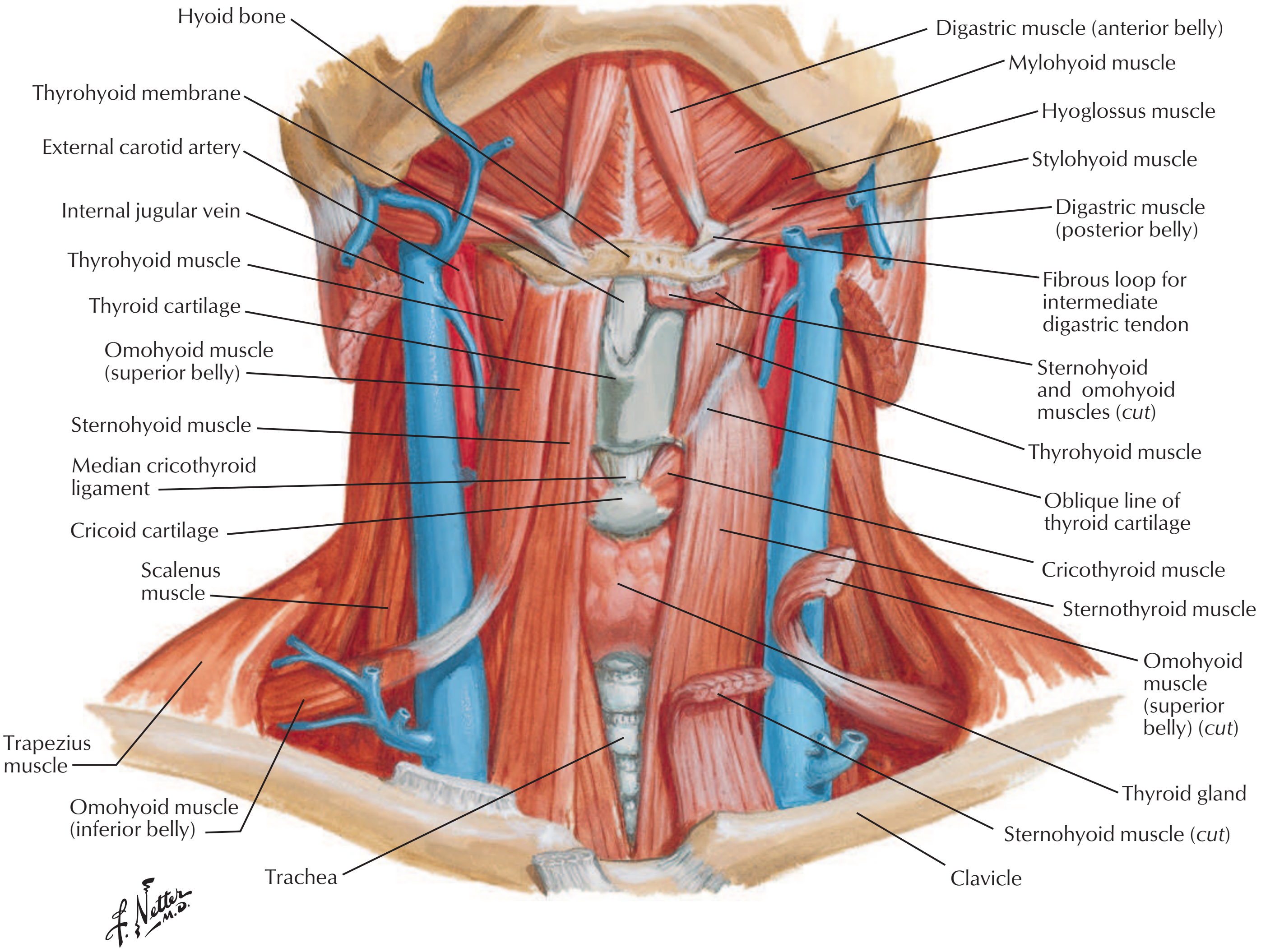
See also Plates 32, 33, 38


🟥 Superficial layer of deep cervical fascia (SLDCF)
🟪 Pretracheal fascia over intrahyoid muscles
🟦 Pretracheal fascia
🟩 Buccopharyngeal fascia
🟪 Carotid sheath
🟧 Prevertebral fascia
Temporalis muscle fascia and tendon temporalis
Superior and inferior heads of lateral pterygoid muscle (*cut to show buccopharyngeal fascia*)
Buccopharyngeal fascia on superior pharyngeal constrictor muscle
Parotid gland and ramus of mandible (*both cut to show buccopharyngeal fascia*)
Sternocleidomastoid muscle (*cut*) and SLDCF
Trapezius muscle
Hyoglossus muscle
Alar fascia
Retropharyngeal space
Posterior and lateral right cricoarytenoid muscles
Cricopharyngeal part of inferior pharyngeal constrictor muscle
Straight and oblique parts of right cricothyroid muscle
Esophagus and trachea
Right recurrent laryngeal nerve
Carotid sheath enveloping internal jugular vein, common carotid artery, and vagus nerve
Clavicle (*cut*)
Esophagus
Second rib
Manubrium
Coronoid process with mandible, masseter, and temporalis muscles (*all cut to show splitting of SLDCF*)
Inferior head of lateral pterygoid muscle
Medial pterygoid muscle and SLDCF
Buccinator muscle (deep to bucco-pharyngeal fascia)
Submandibular gland (*cut*)
Anterior belly of digastric muscle
Mylohyoid muscle
SLDCF (*cut and reflected*)
Right sternohyoid, omohyoid, and thyrohyoid muscles (*cut to expose pretracheal fascia*)
Left thyrohyoid, omohyoid, sternohyoid , and sternocleidomastoid muscles (pretracheal fascia between muscles and the viewer)
SLDCF (*cut and reflected*)
Thyroid gland and pretracheal fascia (*both cut*)
Sternothyroid and sternohyoid muscles (*cut*) and pretracheal fascia
SLDCF (*cut*)
Suprasternal space (of Burns)
C.Machado M.D.

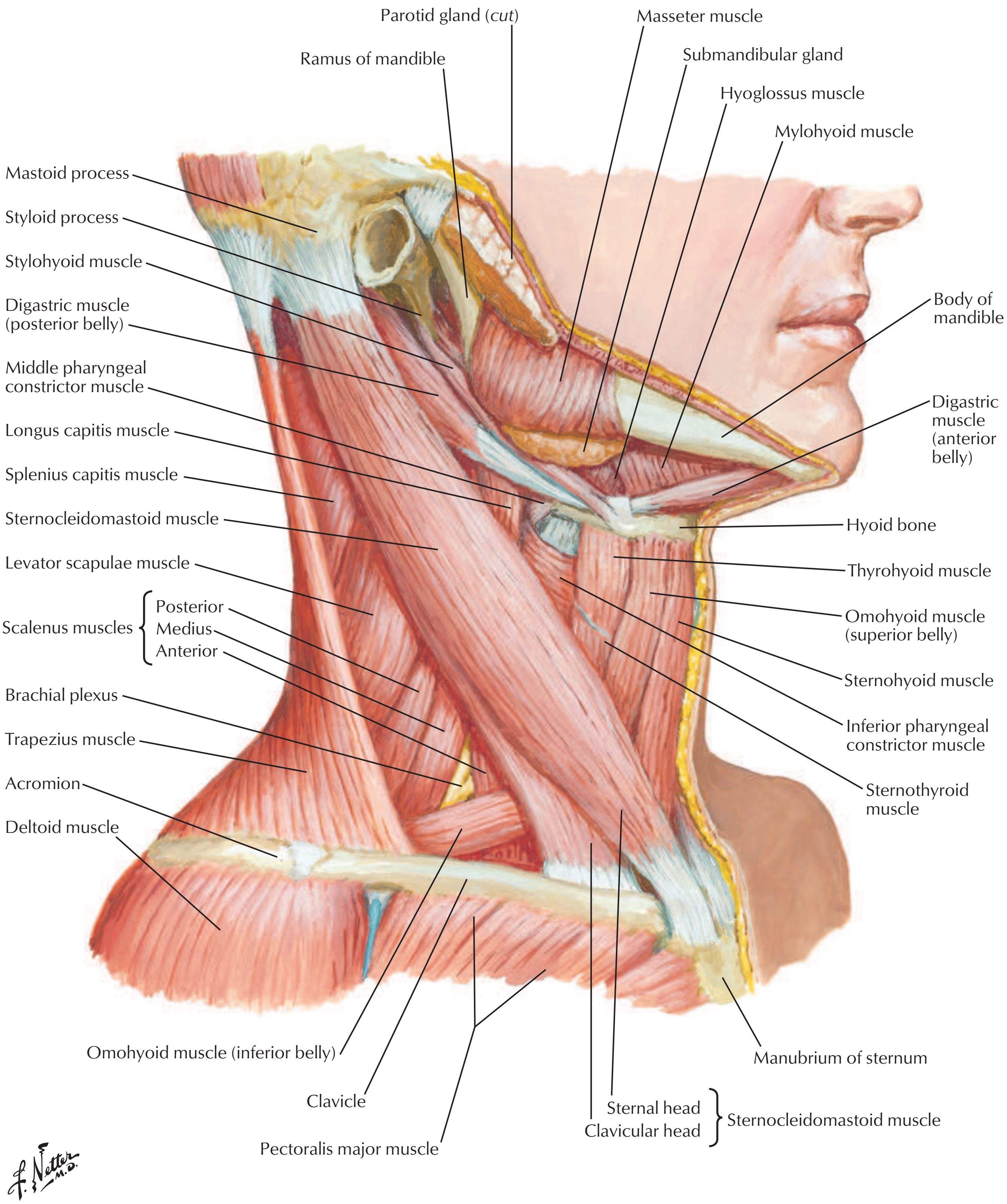
SLDCF: Superficial layer of deep cervical fascia

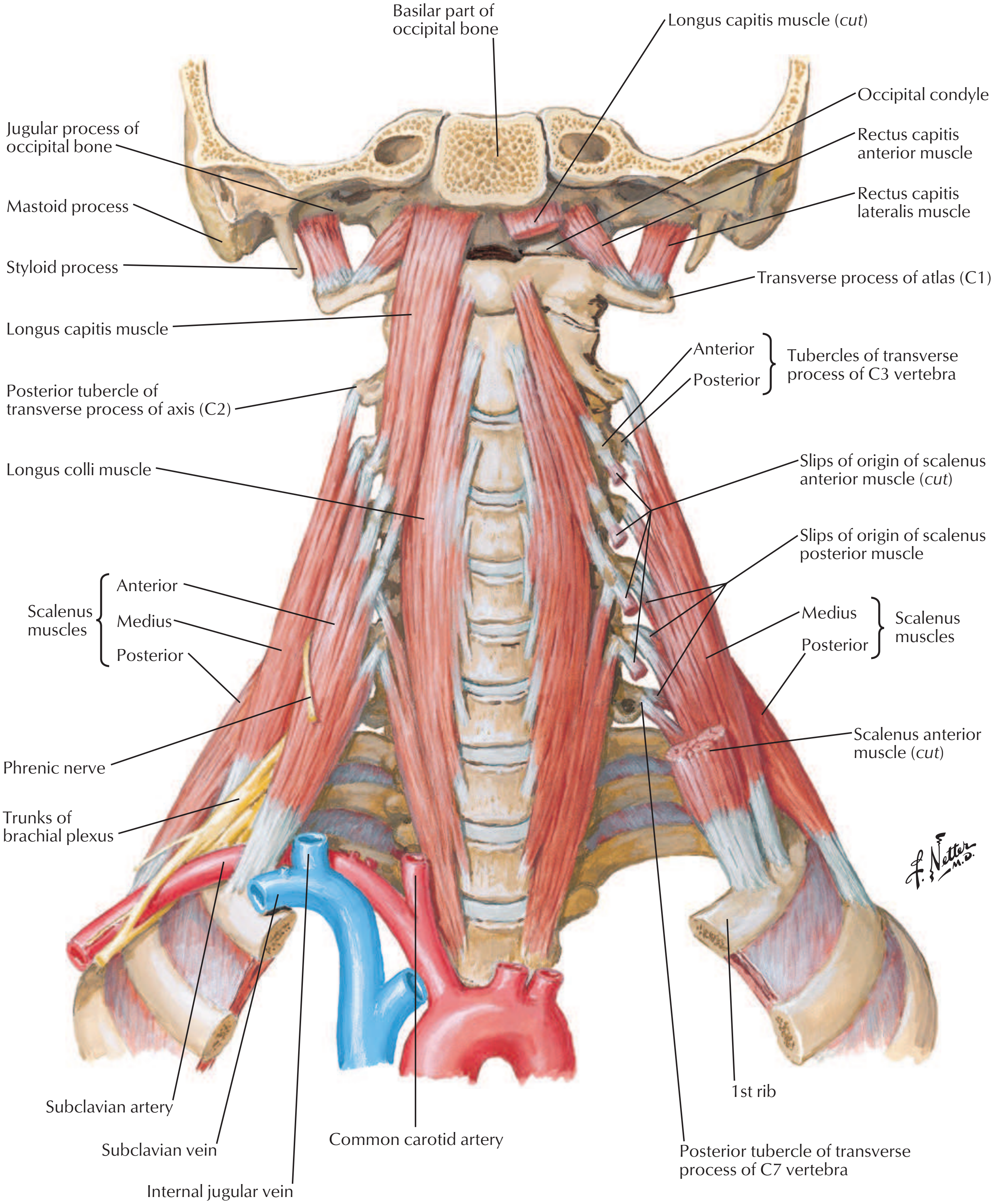
Infrahyoid and Suprahyoid Muscles

See also Plates 32, 36, 69

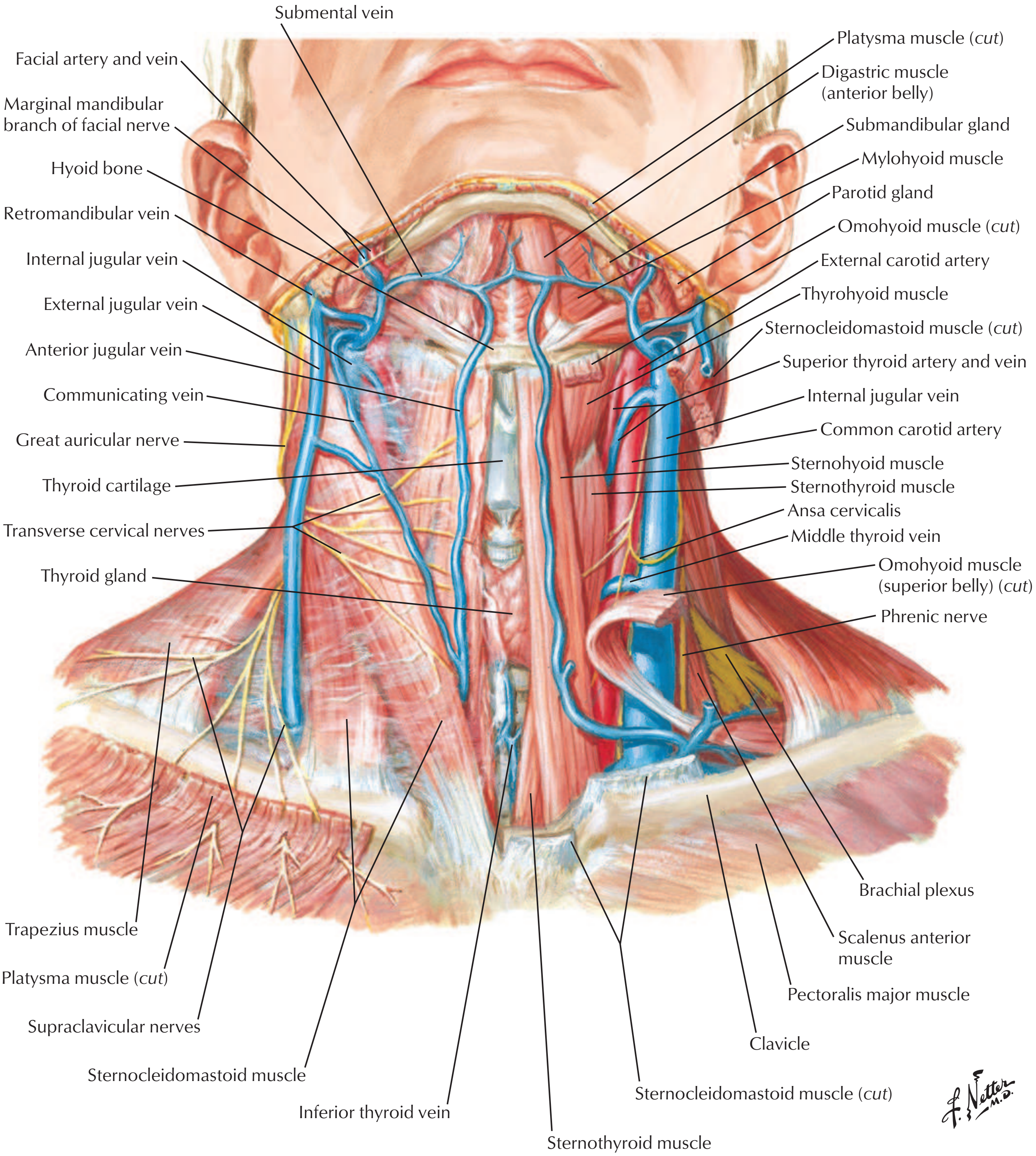

Hyoid bone
Thyrohyoid membrane
External carotid artery
Internal jugular vein
Thyrohyoid muscle
Thyroid cartilage
Omohyoid muscle (superior belly)
Sternohyoid muscle
Median cricothyroid ligament
Cricoid cartilage
Scalenus muscle
Trapezius muscle
Omohyoid muscle (inferior belly)
Trachea
Digastric muscle (anterior belly)
Mylohyoid muscle
Hyoglossus muscle
Stylohyoid muscle
Digastric muscle (posterior belly)
Fibrous loop for intermediate digastric tendon
Sternohyoid and omohyoid muscles (*cut*)
Thyrohyoid muscle
Oblique line of thyroid cartilage
Cricothyroid muscle
Sternothyroid muscle
Omohyoid muscle (superior belly) (*cut*)
Thyroid gland
Sternohyoid muscle (*cut*)
Clavicle

See also Plates 32, 35, 38


Parotid gland (*cut*)
Masseter muscle
Ramus of mandible
Submandibular gland
Hyoglossus muscle
Mylohyoid muscle
Mastoid process
Styloid process
Stylohyoid muscle
Digastric muscle (posterior belly)
Middle pharyngeal constrictor muscle
Longus capitis muscle
Splenius capitis muscle
Sternocleidomastoid muscle
Levator scapulae muscle
Scalenus muscles
Posterior
Medius
Anterior
Brachial plexus
Trapezius muscle
Acromion
Deltoid muscle
Body of mandible
Digastric muscle (anterior belly)
Hyoid bone
Thyrohyoid muscle
Omohyoid muscle (superior belly)
Sternohyoid muscle
Inferior pharyngeal constrictor muscle
Sternothyroid muscle
Manubrium of sternum
Omohyoid muscle (inferior belly)
Clavicle
Pectoralis major muscle
Sternal head
Clavicular head
Sternocleidomastoid muscle
F. Netter M.D.

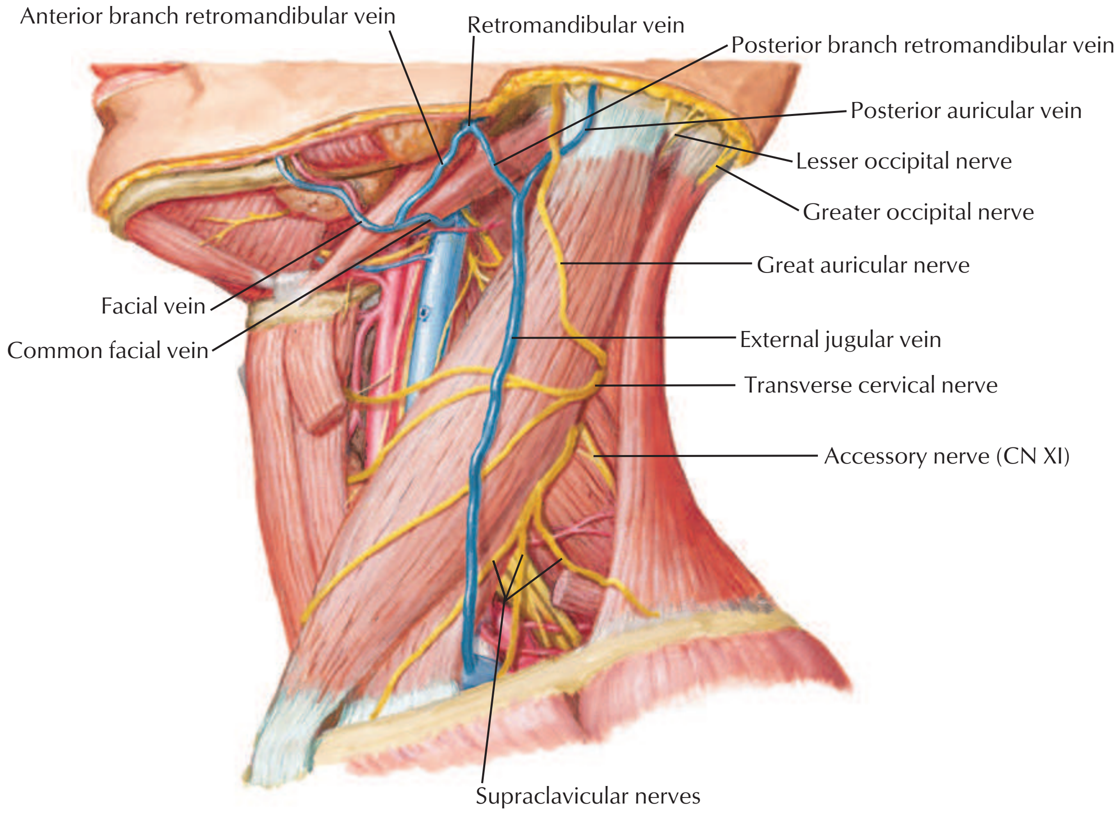

Basilar part of occipital bone
Longus capitis muscle (*cut*)
Occipital condyle
Rectus capitis anterior muscle
Rectus capitis lateralis muscle
Transverse process of atlas (C1)
Jugular process of occipital bone
Mastoid process
Styloid process
Longus capitis muscle
Posterior tubercle of transverse process of axis (C2)
Anterior
Posterior
Tubercles of transverse process of C3 vertebra
Longus colli muscle
Slips of origin of scalenus anterior muscle (*cut*)
Slips of origin of scalenus posterior muscle
Scalenus muscles
Anterior
Medius
Posterior
Medius
Posterior
Scalenus muscles
Phrenic nerve
Scalenus anterior muscle (*cut*)
Trunks of brachial plexus
Subclavian artery
Subclavian vein
Internal jugular vein
Common carotid artery
1st rib
Posterior tubercle of transverse process of C7 vertebra

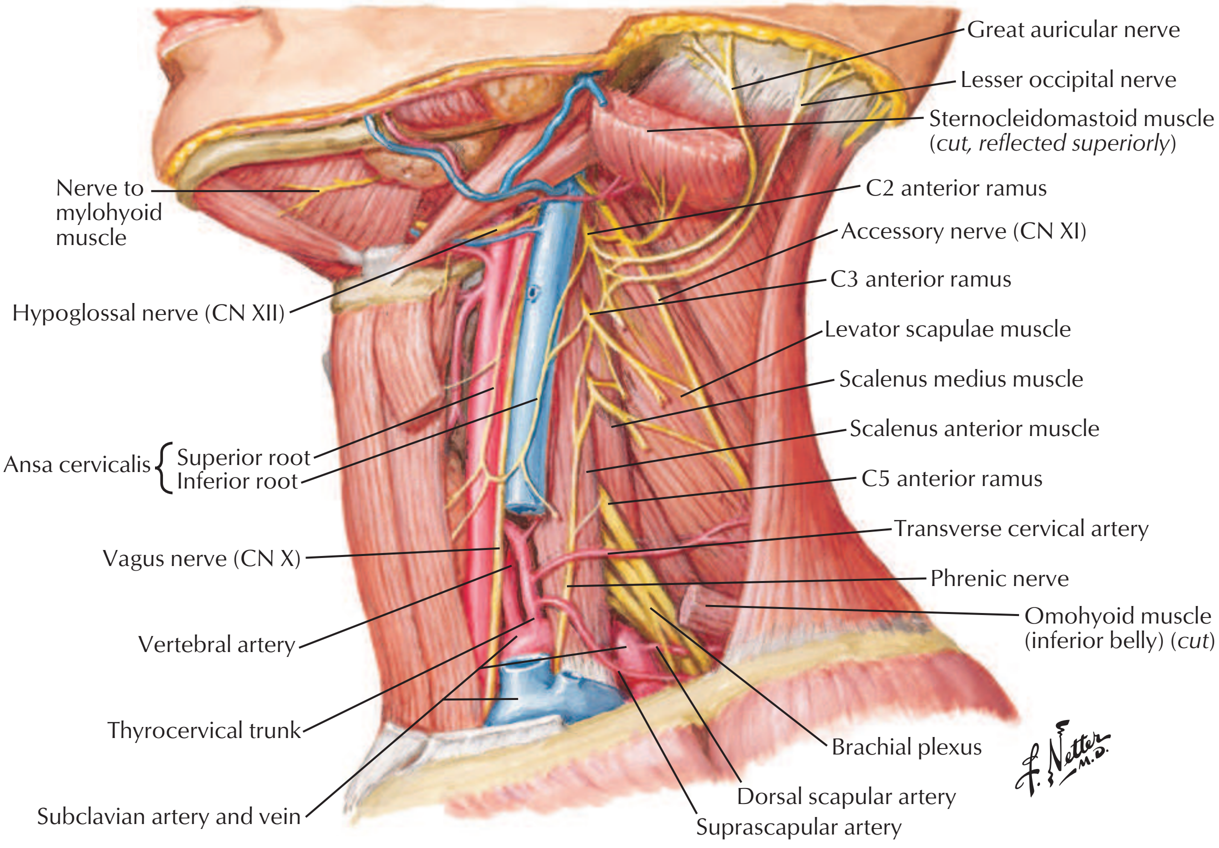
For deep veins of neck see Plate 84

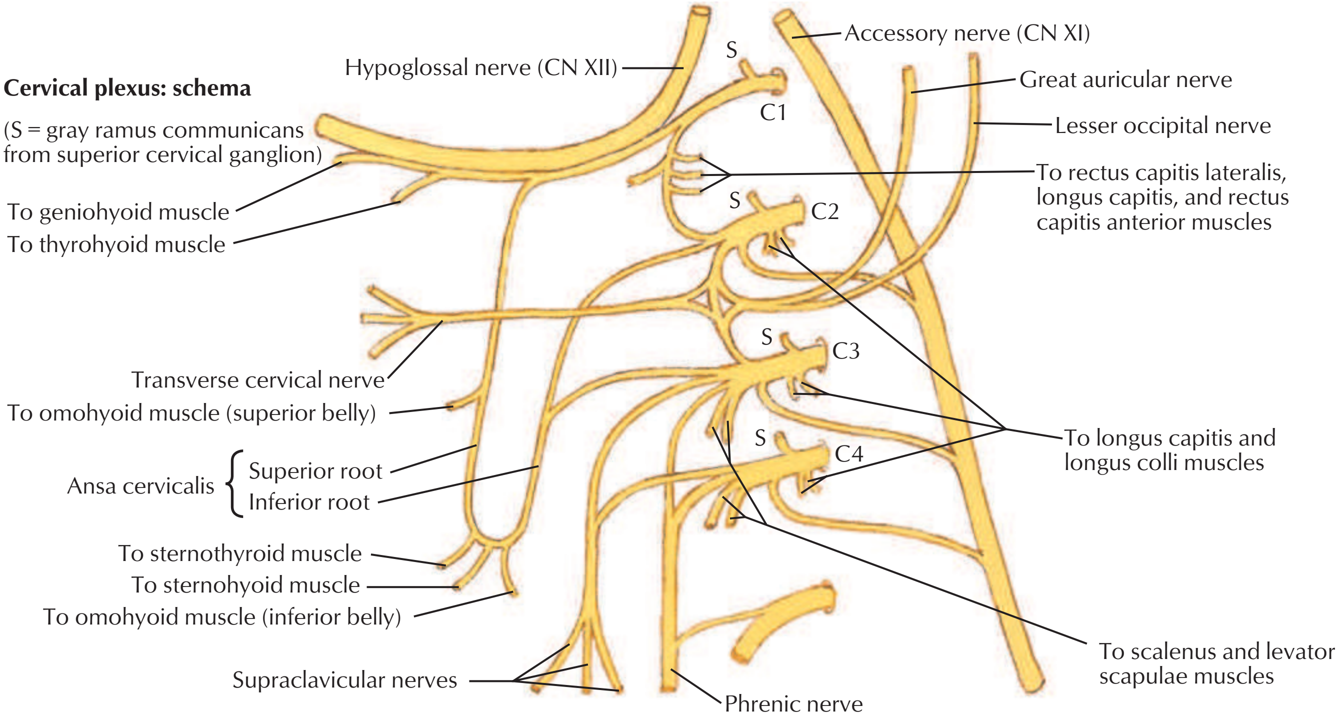

Submental vein
Facial artery and vein
Marginal mandibular branch of facial nerve
Hyoid bone
Retromandibular vein
Internal jugular vein
External jugular vein
Anterior jugular vein
Communicating vein
Great auricular nerve
Thyroid cartilage
Transverse cervical nerves
Thyroid gland
Trapezius muscle
Platysma muscle (cut)
Supraclavicular nerves
Sternocleidomastoid muscle
Inferior thyroid vein
Sternothyroid muscle
Platysma muscle (cut)
Digastric muscle (anterior belly)
Submandibular gland
Mylohyoid muscle
Parotid gland
Omohyoid muscle (cut)
External carotid artery
Thyrohyoid muscle
Sternocleidomastoid muscle (cut)
Superior thyroid artery and vein
Internal jugular vein
Common carotid artery
Sternohyoid muscle
Sternothyroid muscle
Ansa cervicalis
Middle thyroid vein
Omohyoid muscle (superior belly) (cut)
Phrenic nerve
Brachial plexus
Scalenus anterior muscle
Pectoralis major muscle
Clavicle
Sternocleidomastoid muscle (cut)
F. Netter M.D.

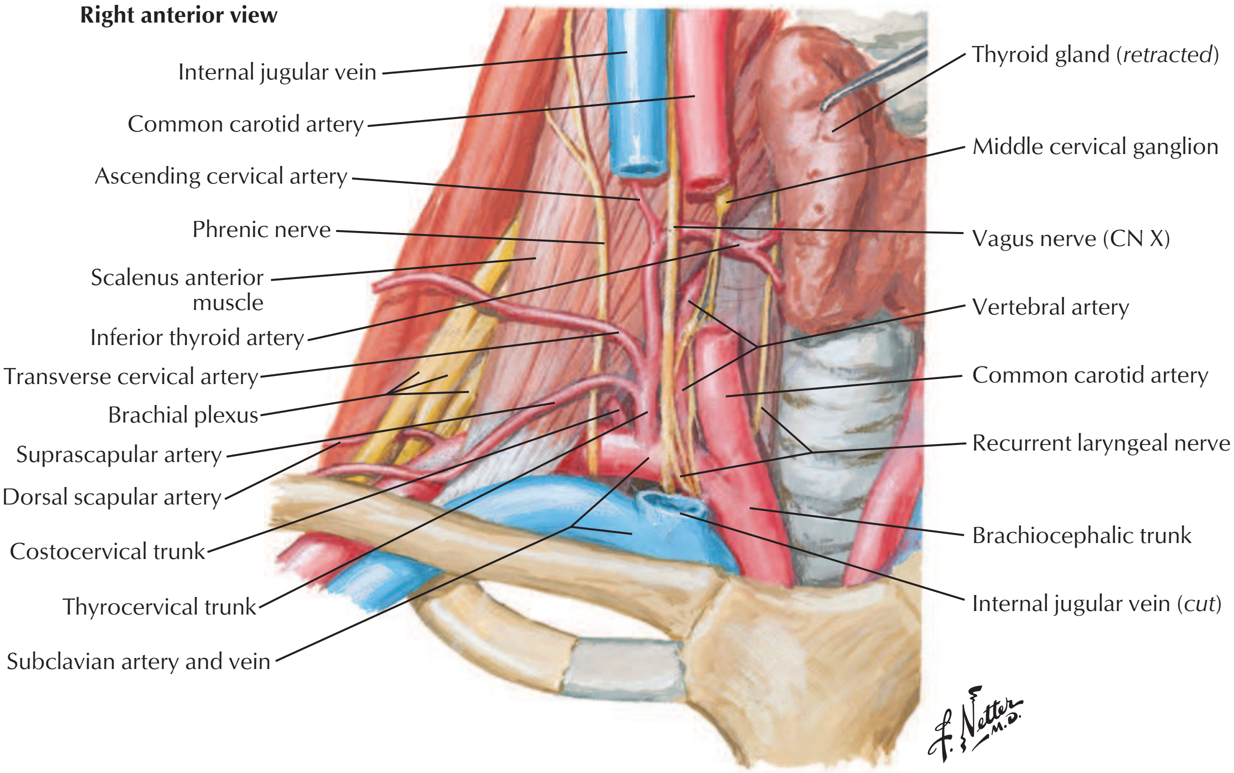
Nerves and Vessels of Neck

See also Plates 138, 139, 140


Anterior branch retromandibular vein
Retromandibular vein
Posterior branch retromandibular vein
Posterior auricular vein
Lesser occipital nerve
Greater occipital nerve
Great auricular nerve
Facial vein
Common facial vein
External jugular vein
Transverse cervical nerve
Accessory nerve (CN XI)
Supraclavicular nerves


Great auricular nerve
Lesser occipital nerve
Sternocleidomastoid muscle (cut, reflected superiorly)
Nerve to mylohyoid muscle
C2 anterior ramus
Accessory nerve (CN XI)
Hypoglossal nerve (CN XII)
C3 anterior ramus
Levator scapulae muscle
Scalenus medius muscle
Scalenus anterior muscle
Ansa cervicalis { Superior root
Inferior root
C5 anterior ramus
Transverse cervical artery
Vagus nerve (CN X)
Phrenic nerve
Omohyoid muscle (inferior belly) (cut)
Vertebral artery
Thyrocervical trunk
Brachial plexus
Subclavian artery and vein
Dorsal scapular artery
Suprascapular artery


Cervical plexus: schema
(S = gray ramus communicans from superior cervical ganglion)
Hypoglossal nerve (CN XII)
S
C1
Accessory nerve (CN XI)
Great auricular nerve
Lesser occipital nerve
To rectus capitis lateralis, longus capitis, and rectus capitis anterior muscles
To geniohyoid muscle
To thyrohyoid muscle
S
C2
S
C3
Transverse cervical nerve
To omohyoid muscle (superior belly)
S
C4
To longus capitis and longus colli muscles
Ansa cervicalis
Superior root
Inferior root
To sternothyroid muscle
To sternohyoid muscle
To omohyoid muscle (inferior belly)
To scalenus and levator scapulae muscles
Supraclavicular nerves
Phrenic nerve


Right anterior view
Internal jugular vein
Common carotid artery
Ascending cervical artery
Phrenic nerve
Scalenus anterior muscle
Inferior thyroid artery
Transverse cervical artery
Brachial plexus
Suprascapular artery
Dorsal scapular artery
Costocervical trunk
Thyrocervical trunk
Subclavian artery and vein
Thyroid gland (retracted)
Middle cervical ganglion
Vagus nerve (CN X)
Vertebral artery
Common carotid artery
Recurrent laryngeal nerve
Brachiocephalic trunk
Internal jugular vein (cut)
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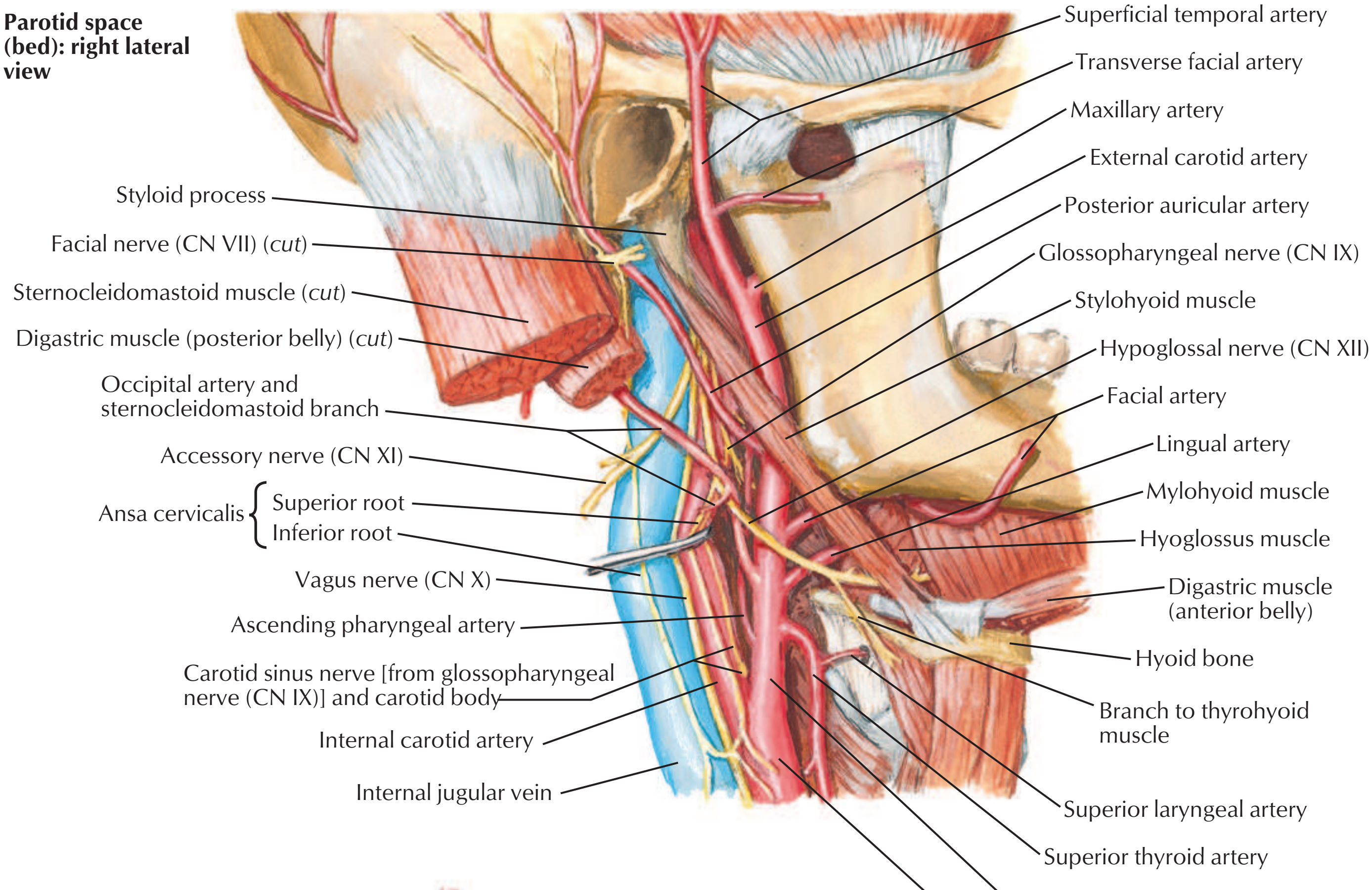
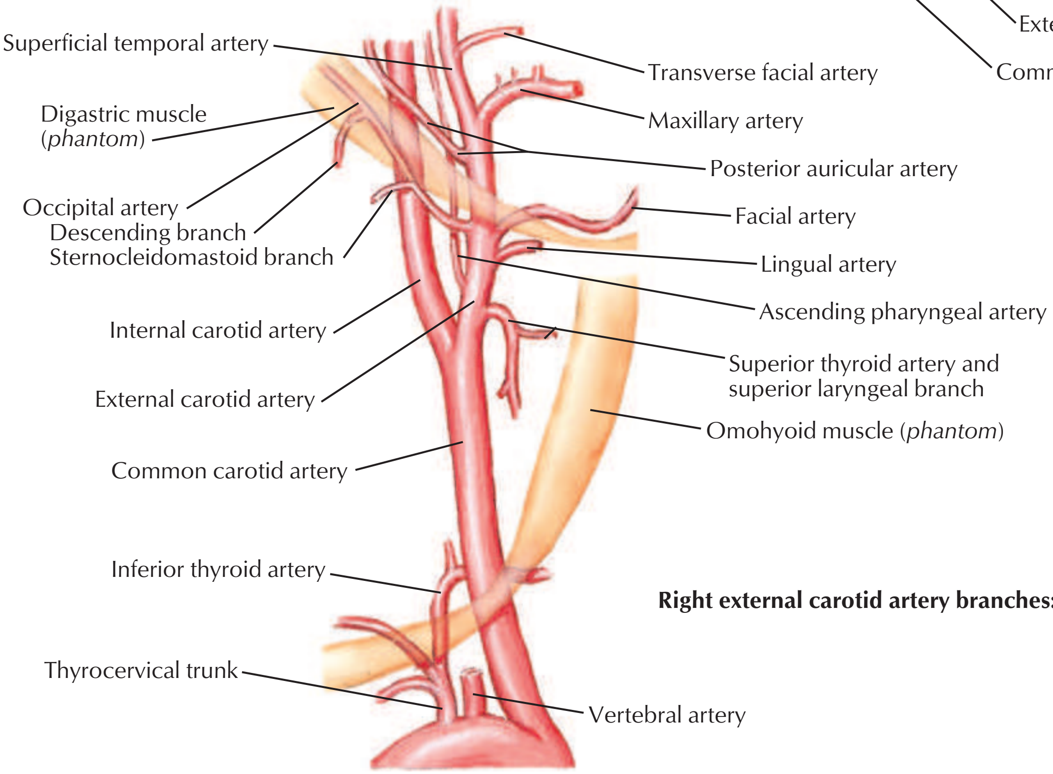
Carotid Arteries

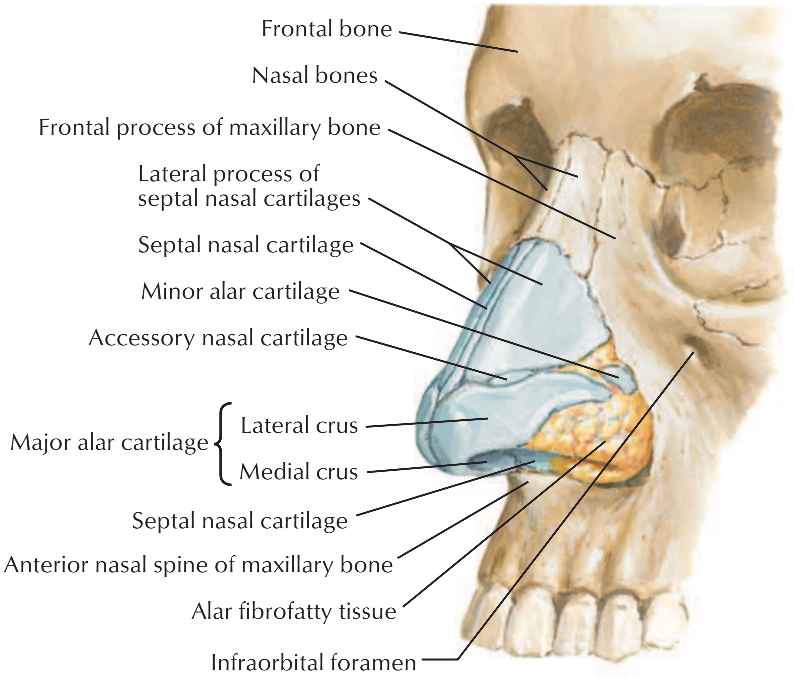
See also Plates 147, 149

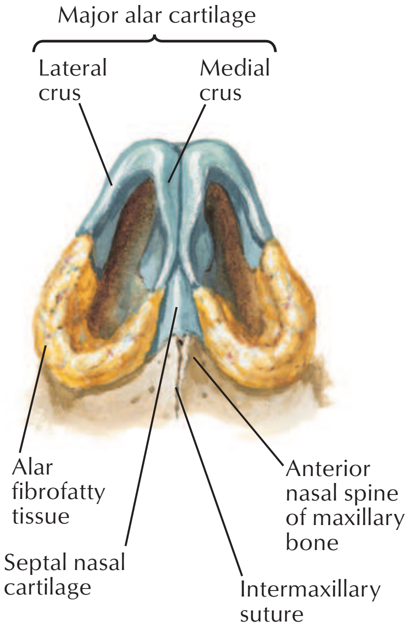
Parotid space (bed): right lateral view

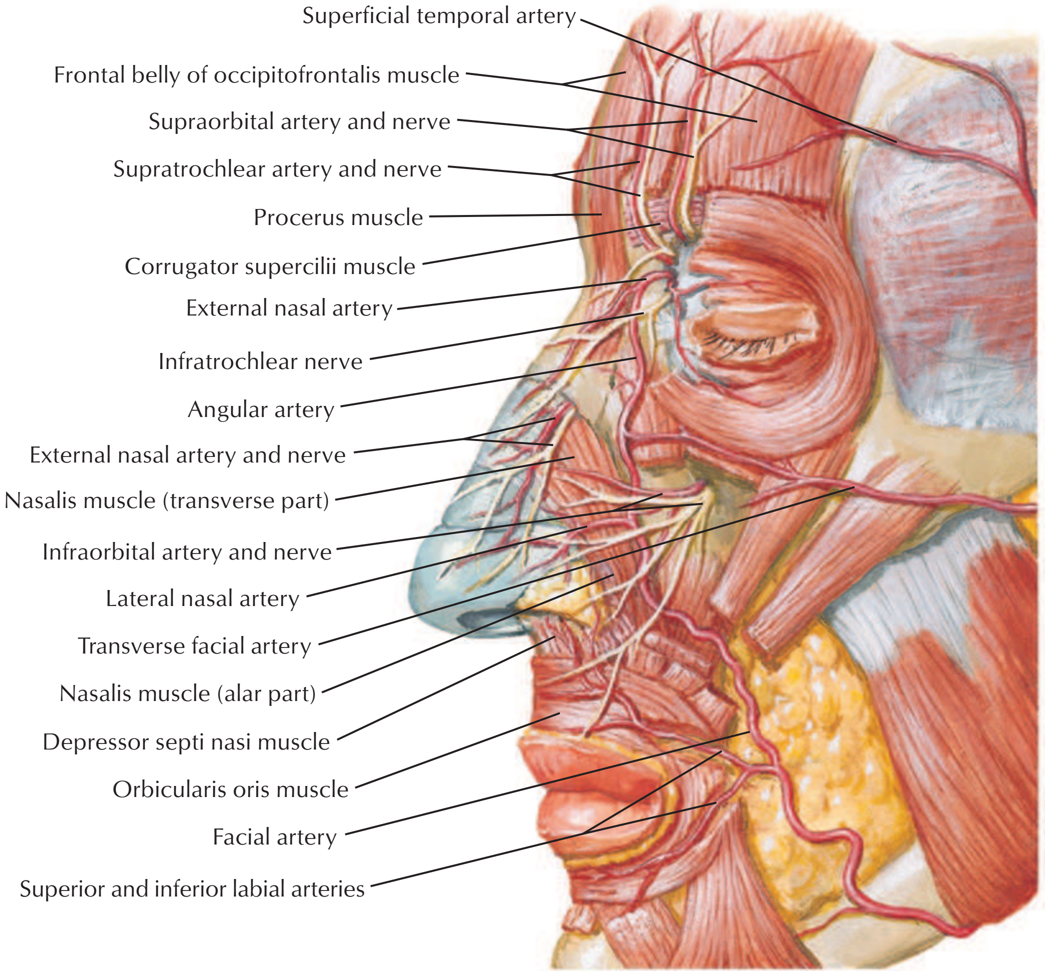

Styloid process
Facial nerve (CN VII) (*cut*)
Sternocleidomastoid muscle (*cut*)
Digastric muscle (posterior belly) (*cut*)
Occipital artery and sternocleidomastoid branch
Accessory nerve (CN XI)
Ansa cervicalis
Superior root
Inferior root
Vagus nerve (CN X)
Ascending pharyngeal artery
Carotid sinus nerve [from glossopharyngeal nerve (CN IX)] and carotid body
Internal carotid artery
Internal jugular vein
Superficial temporal artery
Transverse facial artery
Maxillary artery
External carotid artery
Posterior auricular artery
Glossopharyngeal nerve (CN IX)
Stylohyoid muscle
Hypoglossal nerve (CN XII)
Facial artery
Lingual artery
Mylohyoid muscle
Hyoglossus muscle
Digastric muscle (anterior belly)
Hyoid bone
Branch to thyrohyoid muscle
Superior laryngeal artery
Superior thyroid artery
External carotid artery
Common carotid artery


Superficial temporal artery
Digastric muscle (*phantom*)
Occipital artery
Descending branch
Sternocleidomastoid branch
Internal carotid artery
External carotid artery
Common carotid artery
Inferior thyroid artery
Thyrocervical trunk
Transverse facial artery
Maxillary artery
Posterior auricular artery
Facial artery
Lingual artery
Ascending pharyngeal artery
Superior thyroid artery and superior laryngeal branch
Omohyoid muscle (*phantom*)
Vertebral artery

Right external carotid artery branches: schema

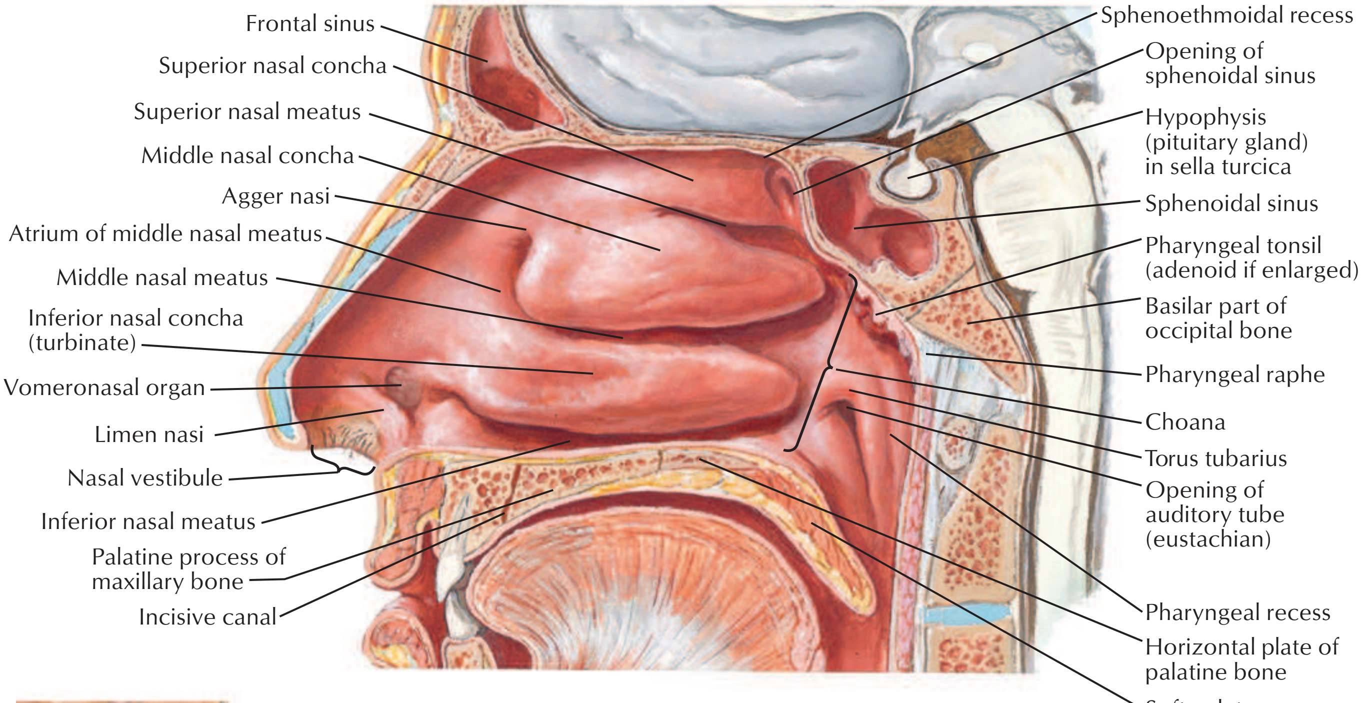

Anterolateral view
Frontal bone
Nasal bones
Frontal process of maxillary bone
Lateral process of septal nasal cartilages
Septal nasal cartilage
Minor alar cartilage
Accessory nasal cartilage
Major alar cartilage
Lateral crus
Medial crus
Septal nasal cartilage
Anterior nasal spine of maxillary bone
Alar fibrofatty tissue
Infraorbital foramen

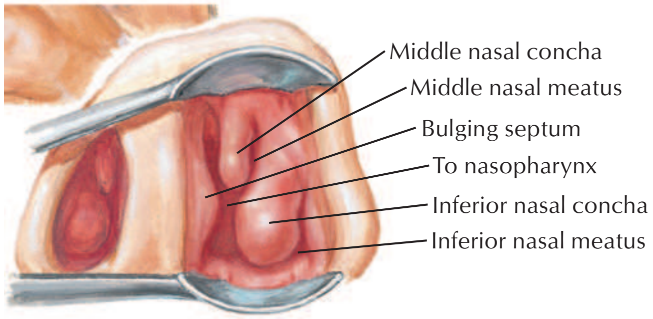

Inferior view
Major alar cartilage
Lateral crus
Medial crus
Alar fibrofatty tissue
Septal nasal cartilage
Anterior nasal spine of maxillary bone
Intermaxillary suture


Superficial temporal artery
Frontal belly of occipitofrontalis muscle
Supraorbital artery and nerve
Supratrochlear artery and nerve
Procerus muscle
Corrugator supercilii muscle
External nasal artery
Infratrochlear nerve
Angular artery
External nasal artery and nerve
Nasalis muscle (transverse part)
Infraorbital artery and nerve
Lateral nasal artery
Transverse facial artery
Nasalis muscle (alar part)
Depressor septi nasi muscle
Orbicularis oris muscle
Facial artery
Superior and inferior labial arteries

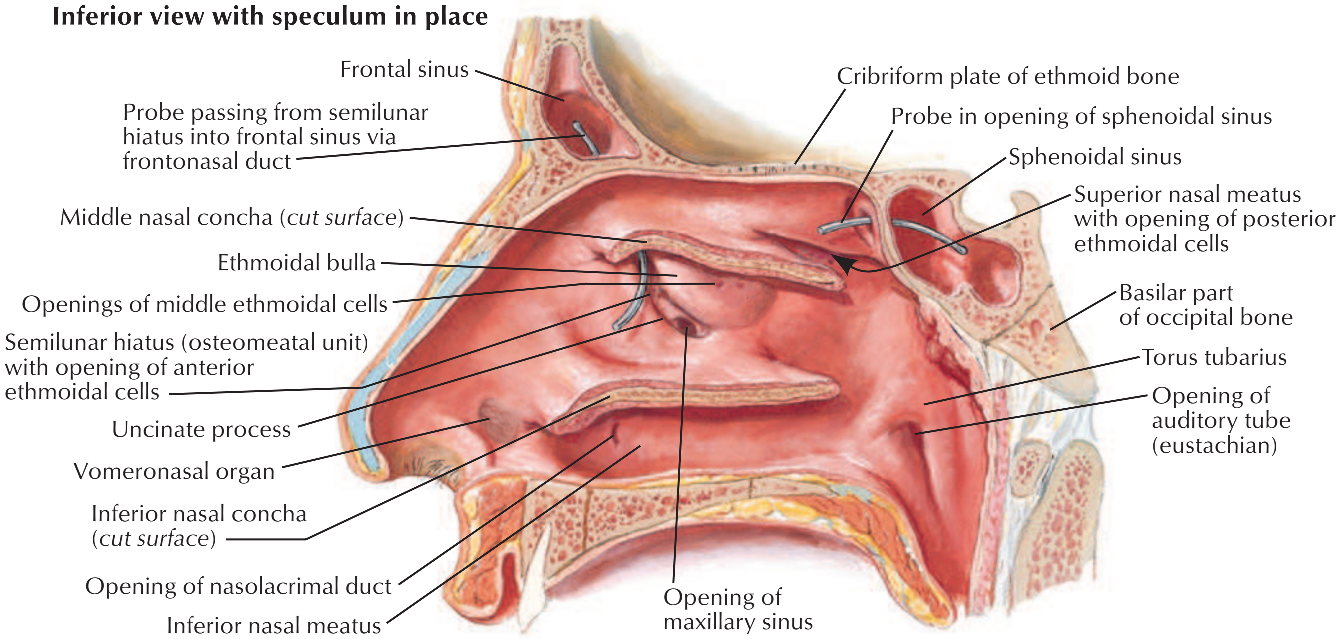
F. Netter M.D.

Lateral Wall of Nasal Cavity


Frontal sinus
Superior nasal concha
Superior nasal meatus
Middle nasal concha
Agger nasi
Atrium of middle nasal meatus
Middle nasal meatus
Inferior nasal concha (turbinate)
Vomeronasal organ
Limen nasi
Nasal vestibule
Inferior nasal meatus
Palatine process of maxillary bone
Incisive canal
Sphenoethmoidal recess
Opening of sphenoidal sinus
Hypophysis (pituitary gland) in sella turcica
Sphenoidal sinus
Pharyngeal tonsil (adenoid if enlarged)
Basilar part of occipital bone
Pharyngeal raphe
Choana
Torus tubarius
Opening of auditory tube (eustachian)
Pharyngeal recess
Horizontal plate of palatine bone
Soft palate

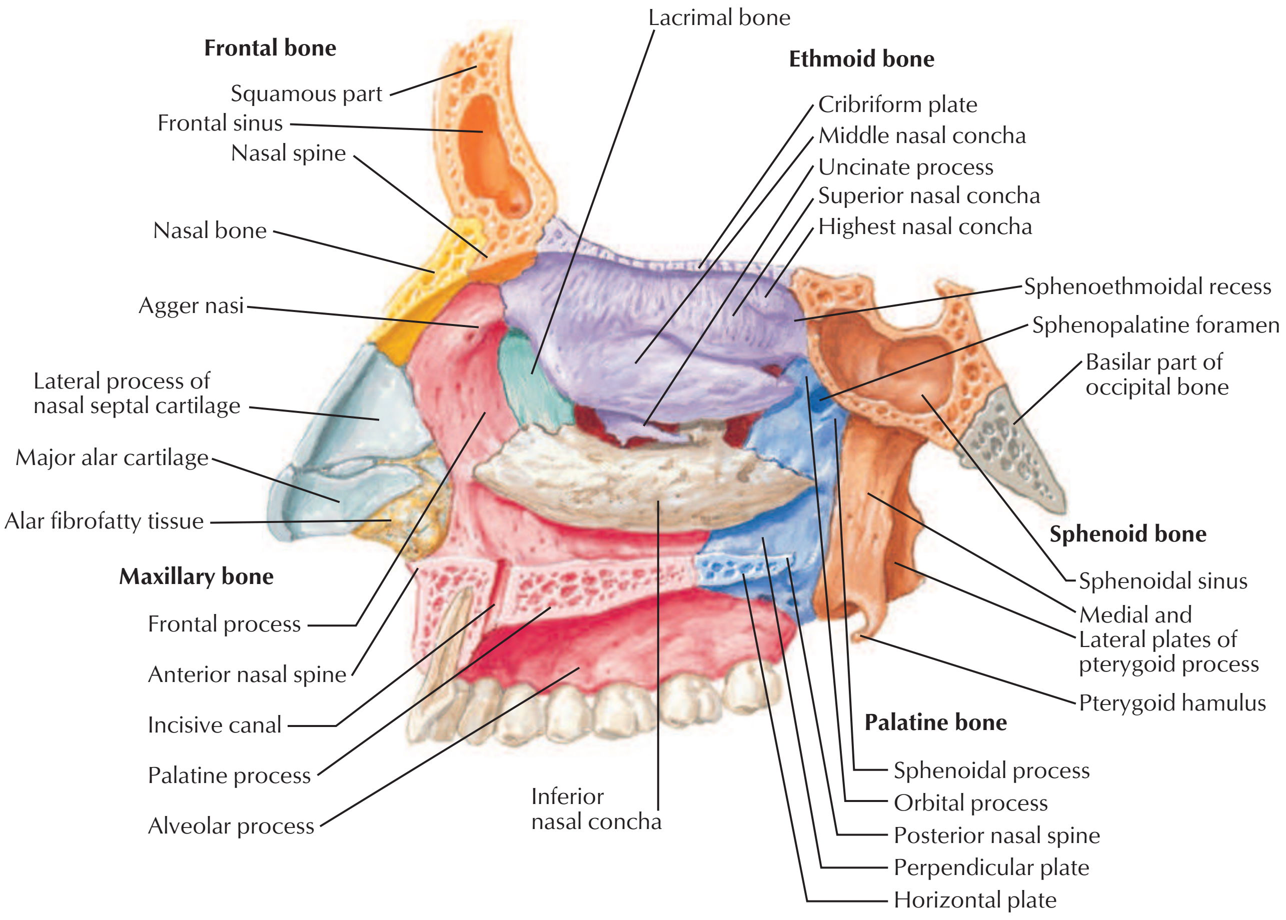

Middle nasal concha
Middle nasal meatus
Bulging septum
To nasopharynx
Inferior nasal concha
Inferior nasal meatus

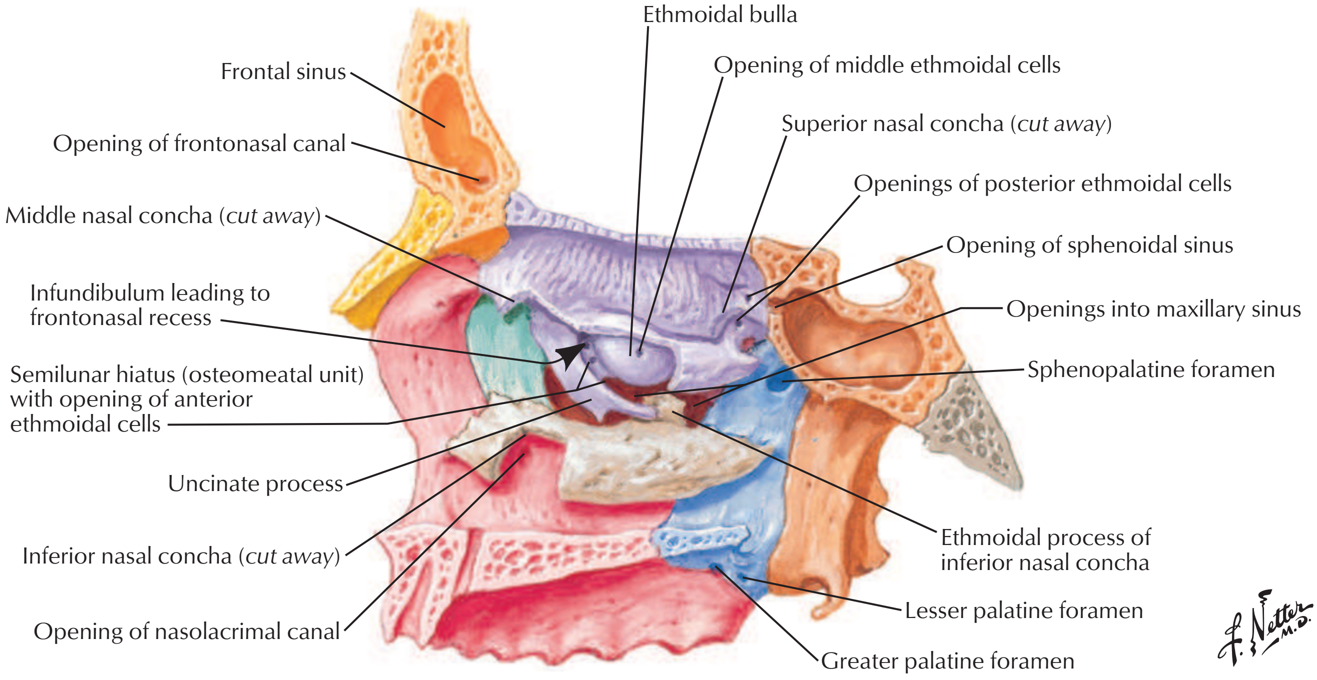
Inferior view with speculum in place


Frontal sinus
Probe passing from semilunar hiatus into frontal sinus via frontonasal duct
Middle nasal concha (*cut surface*)
Ethmoidal bulla
Openings of middle ethmoidal cells
Semilunar hiatus (osteomeatal unit) with opening of anterior ethmoidal cells
Uncinate process
Vomeronasal organ
Inferior nasal concha (*cut surface*)
Opening of nasolacrimal duct
Inferior nasal meatus
Opening of maxillary sinus
Cribriform plate of ethmoid bone
Probe in opening of sphenoidal sinus
Sphenoidal sinus
Superior nasal meatus with opening of posterior ethmoidal cells
Basilar part of occipital bone
Torus tubarius
Opening of auditory tube (eustachian)

Lateral Wall of Nasal Cavity (continued)

See also Plates 43, 45


Lacrimal bone
Frontal bone
Squamous part
Frontal sinus
Nasal spine
Nasal bone
Agger nasi
Lateral process of nasal septal cartilage
Major alar cartilage
Alar fibrofatty tissue
Maxillary bone
Frontal process
Anterior nasal spine
Incisive canal
Palatine process
Alveolar process
Inferior nasal concha
Ethmoid bone
Cribriform plate
Middle nasal concha
Uncinate process
Superior nasal concha
Highest nasal concha
Sphenoethmoidal recess
Sphenopalatine foramen
Basilar part of occipital bone
Sphenoid bone
Sphenoidal sinus
Medial and Lateral plates of pterygoid process
Pterygoid hamulus
Palatine bone
Sphenoidal process
Orbital process
Posterior nasal spine
Perpendicular plate
Horizontal plate


Ethmoidal bulla
Opening of middle ethmoidal cells
Superior nasal concha (*cut away*)
Openings of posterior ethmoidal cells
Opening of sphenoidal sinus
Openings into maxillary sinus
Sphenopalatine foramen
Frontal sinus
Opening of frontonasal canal
Middle nasal concha (*cut away*)
Infundibulum leading to frontonasal recess
Semilunar hiatus (osteomeatal unit) with opening of anterior ethmoidal cells
Uncinate process
Inferior nasal concha (*cut away*)
Opening of nasolacrimal canal
Ethmoidal process of inferior nasal concha
Lesser palatine foramen
Greater palatine foramen
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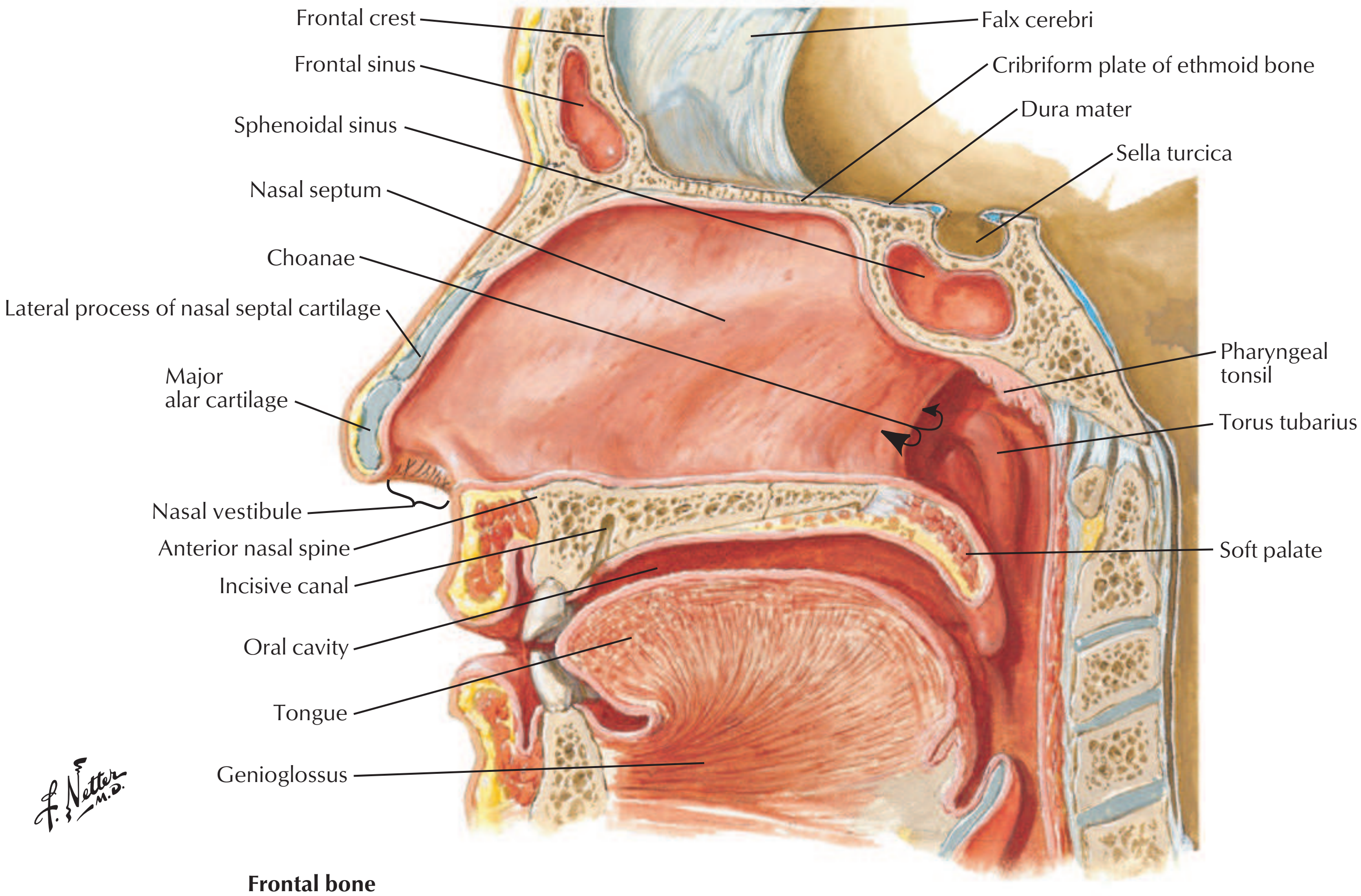
Medial Wall of Nasal Cavity (Nasal Septum)

See also **Plate 15**


Frontal crest
Frontal sinus
Sphenoidal sinus
Nasal septum
Choanae
Lateral process of nasal septal cartilage
Major alar cartilage
Nasal vestibule
Anterior nasal spine
Incisive canal
Oral cavity
Tongue
Genioglossus
Falx cerebri
Cribriform plate of ethmoid bone
Dura mater
Sella turcica
Pharyngeal tonsil
Torus tubarius
Soft palate
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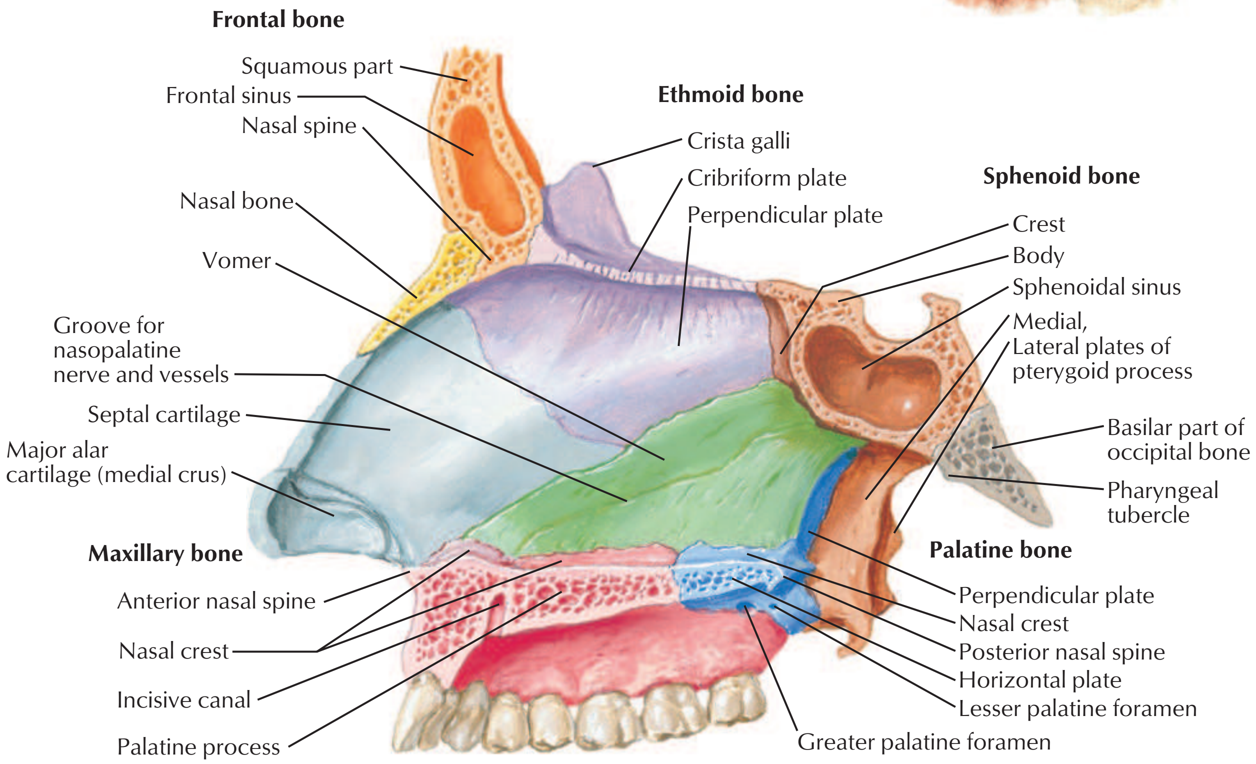
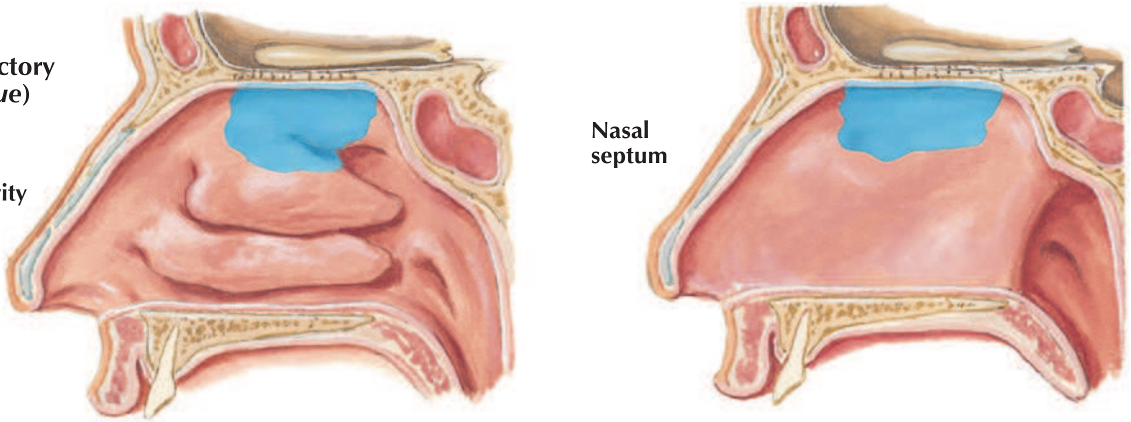

Frontal bone
Squamous part
Frontal sinus
Nasal spine
Nasal bone
Vomer
Groove for nasopalatine nerve and vessels
Septal cartilage
Major alar cartilage (medial crus)
Maxillary bone
Anterior nasal spine
Nasal crest
Incisive canal
Palatine process
Ethmoid bone
Crista galli
Cribriform plate
Perpendicular plate
Sphenoid bone
Crest
Body
Sphenoidal sinus
Medial, Lateral plates of pterygoid process
Basilar part of occipital bone
Pharyngeal tubercle
Palatine bone
Perpendicular plate
Nasal crest
Posterior nasal spine
Horizontal plate
Lesser palatine foramen
Greater palatine foramen

Nerves of Nasal Cavity

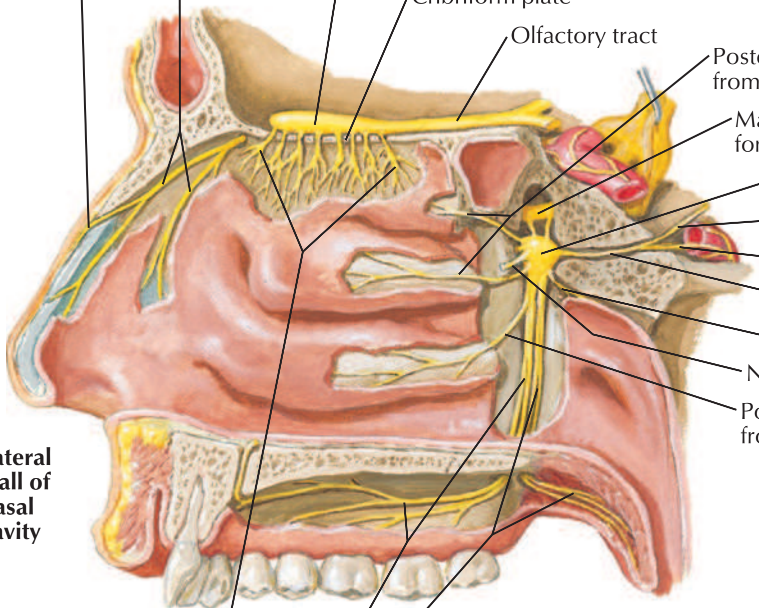
See also Plates 63, 73, 130

Distribution of olfactory mucosa (*shaded blue*)

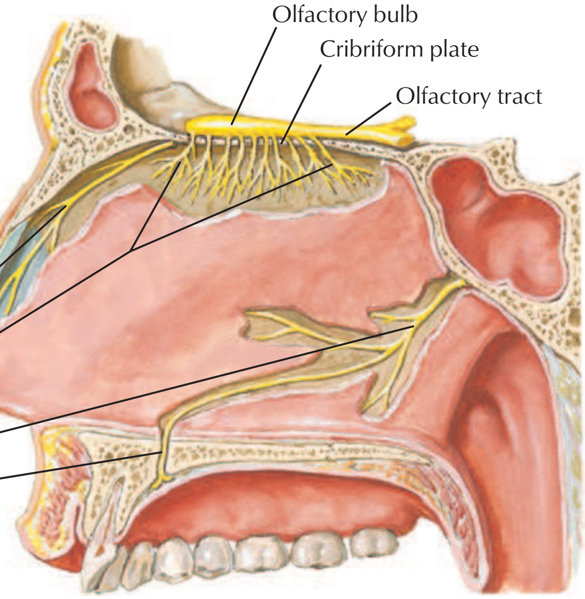


Lateral wall of nasal cavity

Nasal septum


External nasal branch of anterior ethmoidal nerve (CN V_1)
Lateral internal nasal branch of anterior ethmoidal nerve (CN V_1)
Olfactory bulb
Cribriform plate
Olfactory tract
Posterior superior lateral nasal branches from pterygopalatine ganglion
Maxillary nerve (CN V_2) (sphenopalatine foramen dissected away)
Pterygopalatine ganglion
Greater petrosal nerve
Deep petrosal nerve
Nerve (vidian) of pterygoid canal
Pharyngeal branch of pterygopalatine ganglion
Nasopalatine nerve (CN V_2) passing to nasal septum (*cut*)
Posterior inferior lateral nasal branch from greater palatine nerve (CN V_2)
Olfactory nerves (CN I)
Palatine nerves (CN V_2) { Greater
Lesser

Lateral wall of nasal cavity

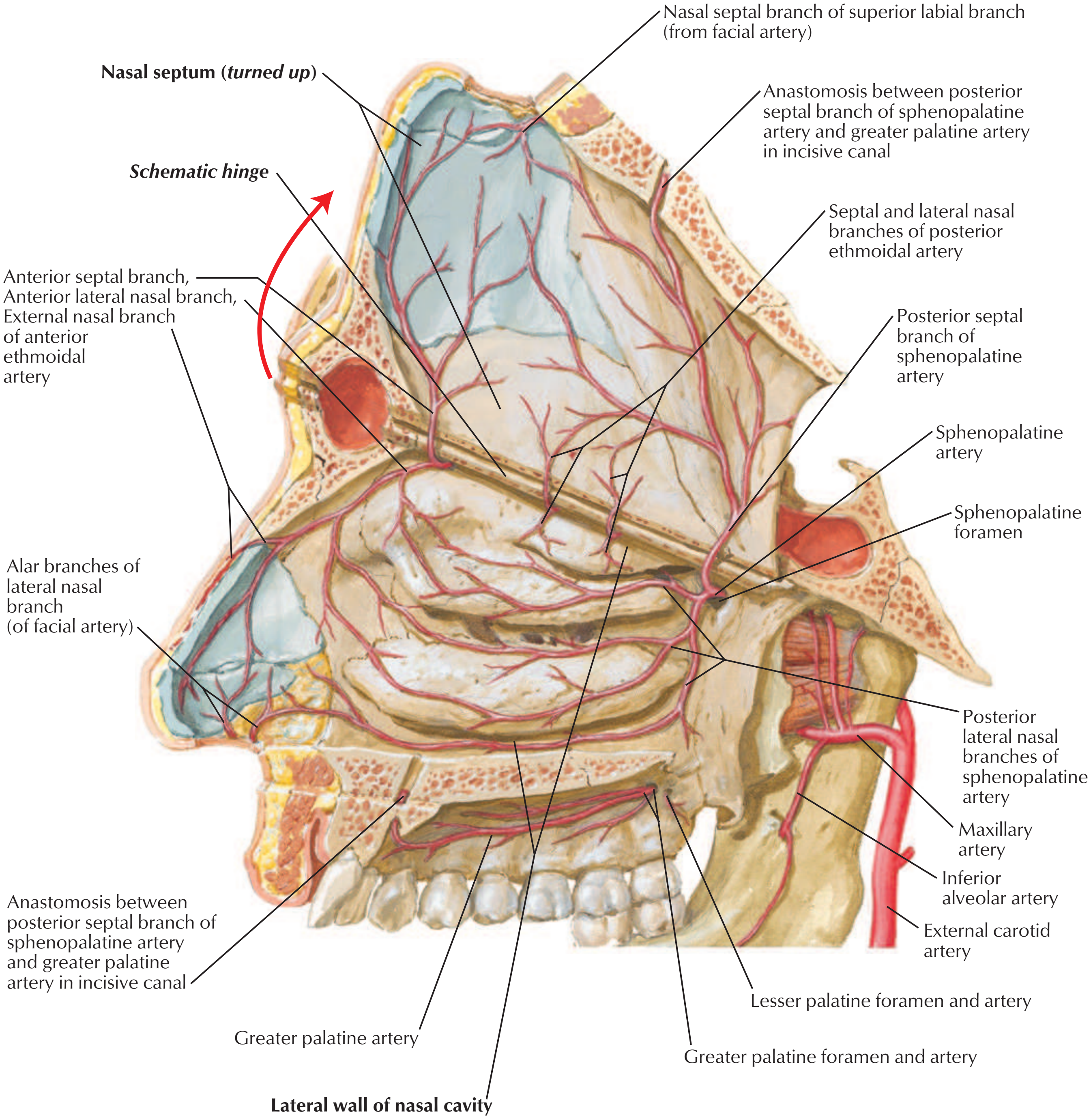

Olfactory bulb
Cribriform plate
Olfactory tract
Medial internal nasal branch of anterior ethmoidal nerve (CN V_1)
Olfactory nerves (CN I)
Nasopalatine nerve (CN V_2)
Incisive canal

Nasal septum

F. Netter M.D.

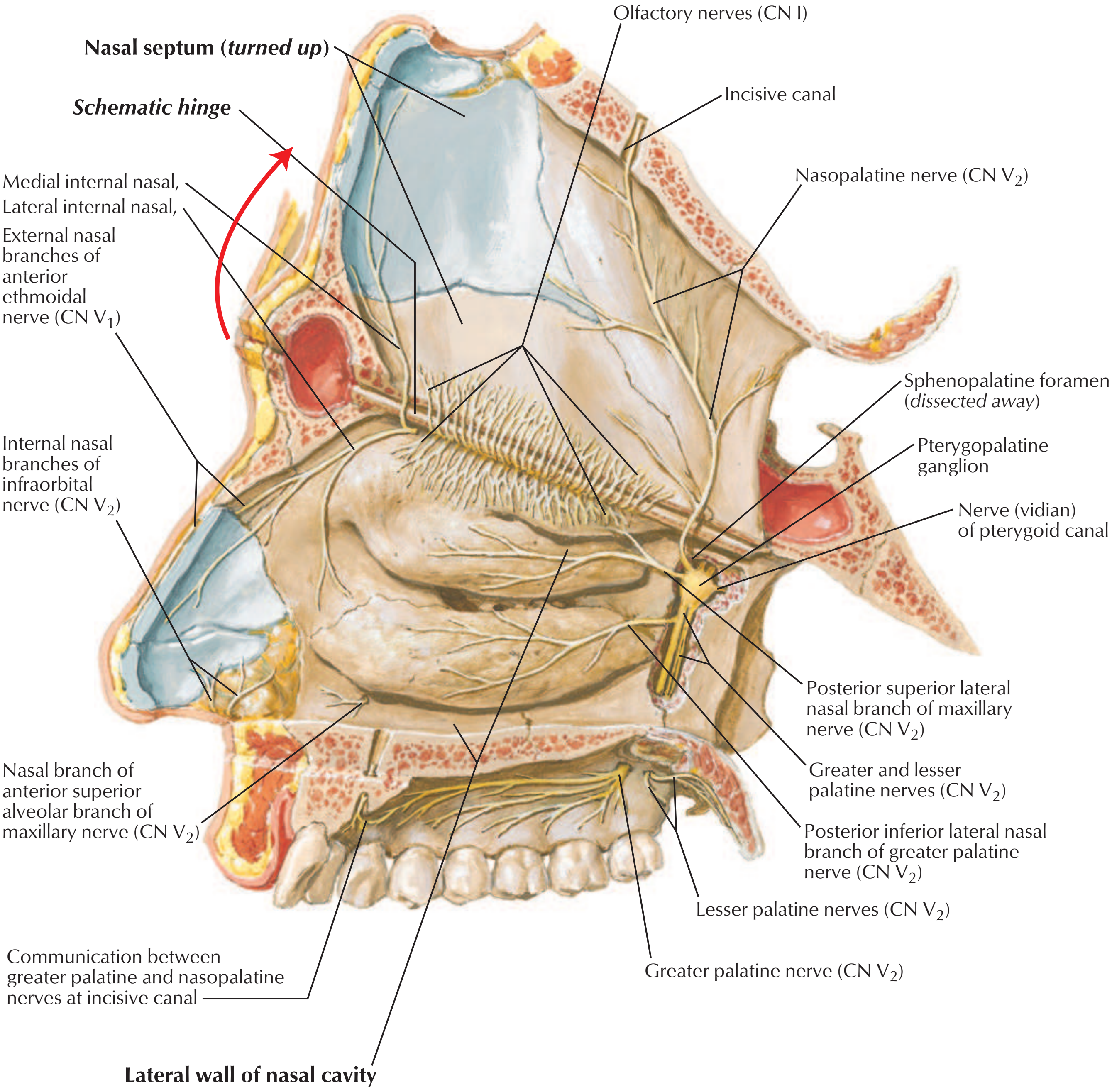
Arteries of Nasal Cavity: Bony Nasal Septum Turned Up

See also Plates 57, 63

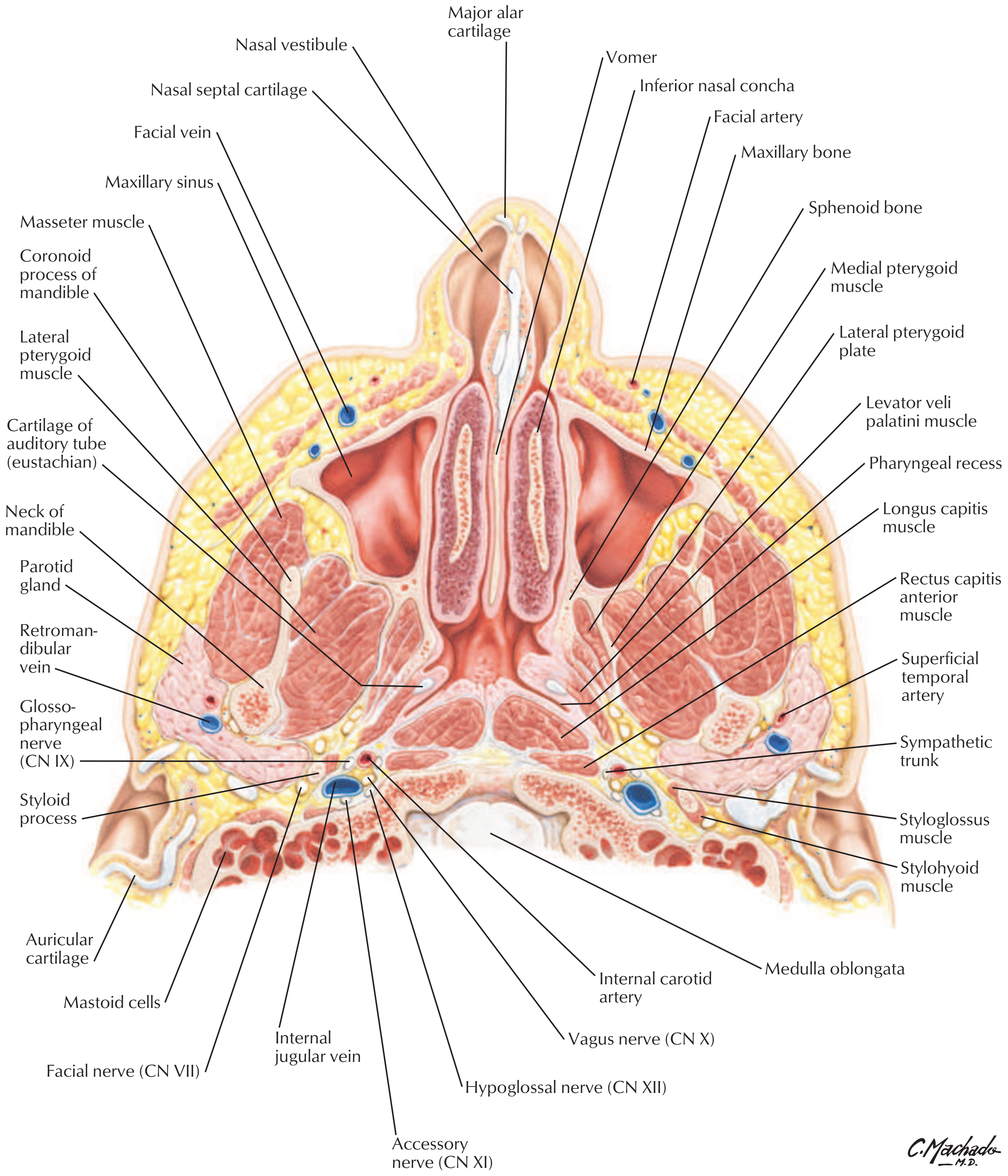

Nasal septal branch of superior labial branch (from facial artery)
Nasal septum (*turned up*)
Anastomosis between posterior septal branch of sphenopalatine artery and greater palatine artery in incisive canal
Schematic hinge
Septal and lateral nasal branches of posterior ethmoidal artery
Anterior septal branch, Anterior lateral nasal branch, External nasal branch of anterior ethmoidal artery
Posterior septal branch of sphenopalatine artery
Sphenopalatine artery
Sphenopalatine foramen
Alar branches of lateral nasal branch (of facial artery)
Posterior lateral nasal branches of sphenopalatine artery
Maxillary artery
Inferior alveolar artery
External carotid artery
Anastomosis between posterior septal branch of sphenopalatine artery and greater palatine artery in incisive canal
Lesser palatine foramen and artery
Greater palatine artery
Greater palatine foramen and artery
Lateral wall of nasal cavity

Nerves of Nasal Cavity: Bony Nasal Septum Turned Up

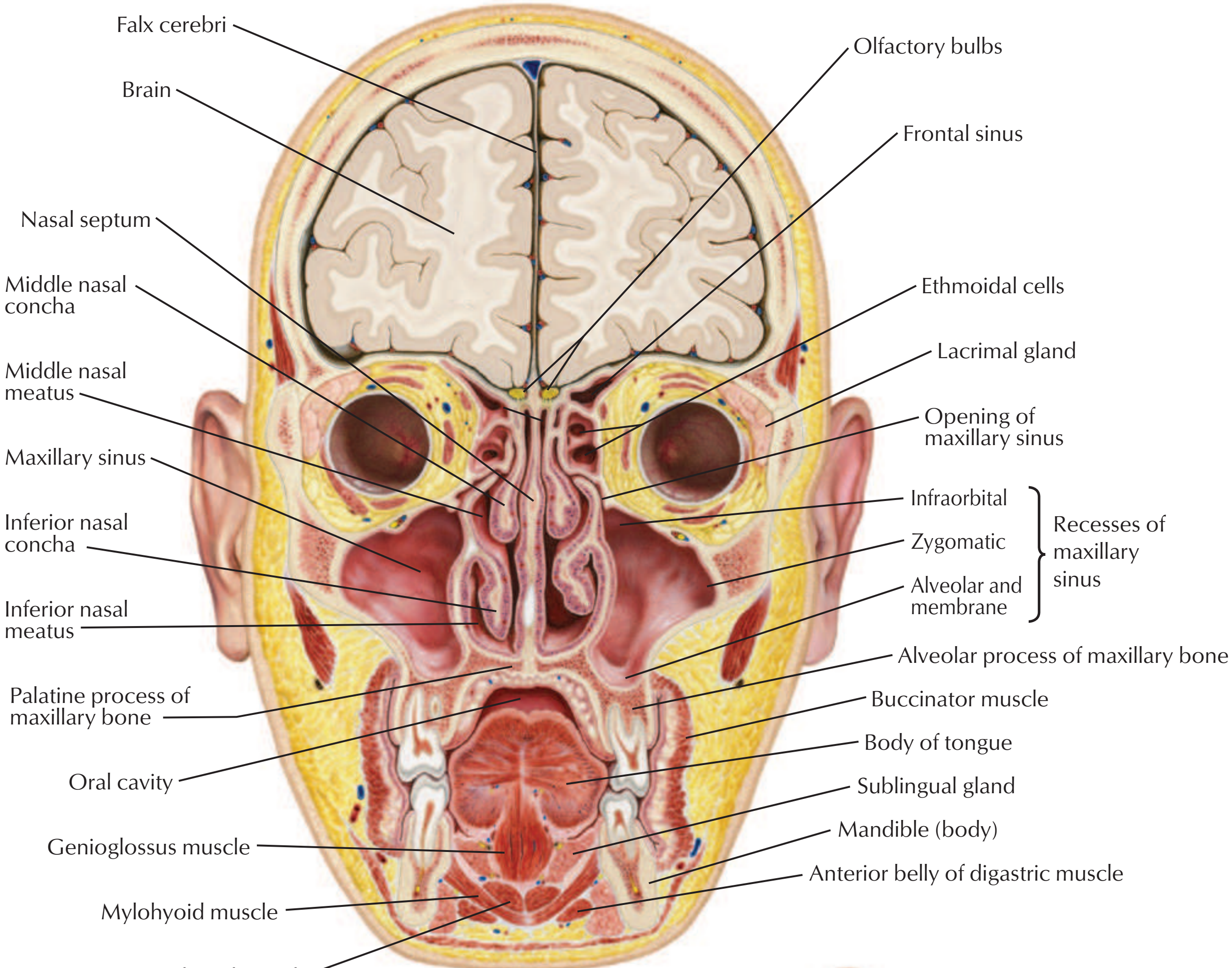
See also Plate 62


Nasal septum (*turned up*)
Schematic hinge
Medial internal nasal,
Lateral internal nasal,
External nasal branches of anterior ethmoidal nerve (CN V_1)
Internal nasal branches of infraorbital nerve (CN V_2)
Nasal branch of anterior superior alveolar branch of maxillary nerve (CN V_2)
Communication between greater palatine and nasopalatine nerves at incisive canal
Lateral wall of nasal cavity
Olfactory nerves (CN I)
Incisive canal
Nasopalatine nerve (CN V_2)
Sphenopalatine foramen (*dissected away*)
Pterygopalatine ganglion
Nerve (vidian) of pterygoid canal
Posterior superior lateral nasal branch of maxillary nerve (CN V_2)
Greater and lesser palatine nerves (CN V_2)
Posterior inferior lateral nasal branch of greater palatine nerve (CN V_2)
Lesser palatine nerves (CN V_2)
Greater palatine nerve (CN V_2)
F. Netter M.D.

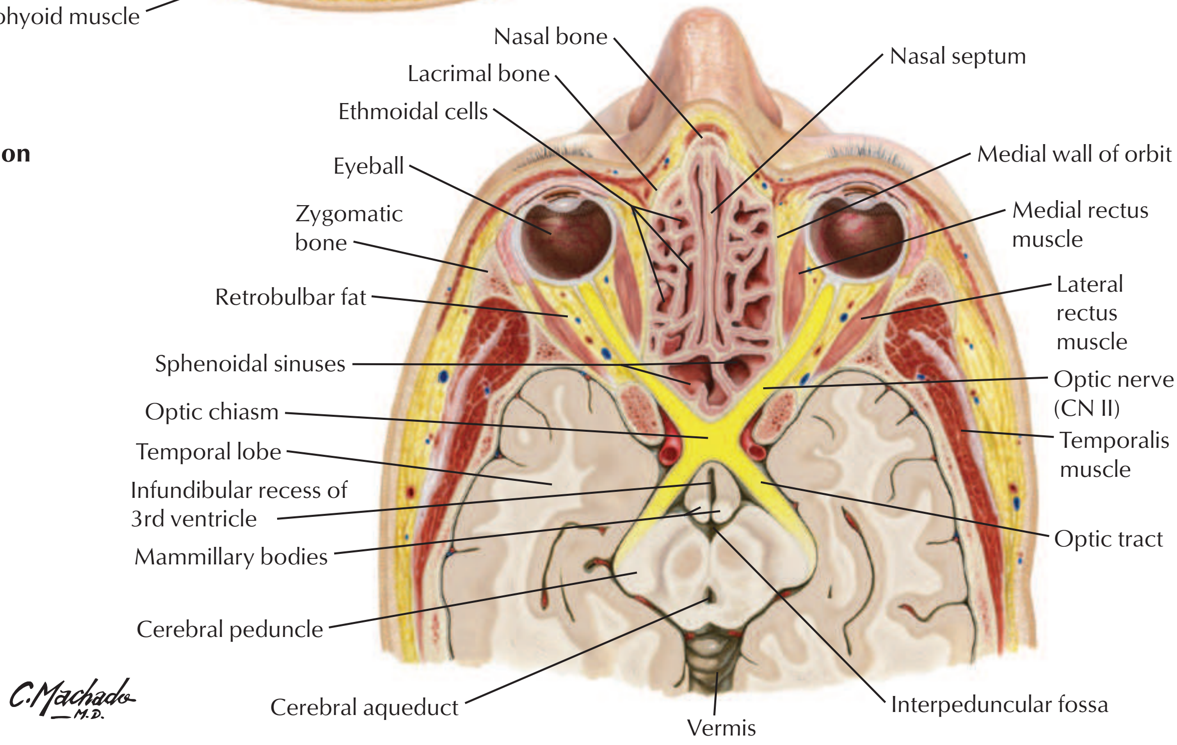
Nose and Maxillary Sinus: Transverse Section


Major alar cartilage
Nasal vestibule
Vomer
Inferior nasal concha
Nasal septal cartilage
Facial artery
Facial vein
Maxillary bone
Maxillary sinus
Sphenoid bone
Masseter muscle
Coronoid process of mandible
Medial pterygoid muscle
Lateral pterygoid muscle
Lateral pterygoid plate
Levator veli palatini muscle
Cartilage of auditory tube (eustachian)
Pharyngeal recess
Neck of mandible
Longus capitis muscle
Parotid gland
Rectus capitis anterior muscle
Retromandibular vein
Superficial temporal artery
Glossopharyngeal nerve (CN IX)
Sympathetic trunk
Styloid process
Styloglossus muscle
Stylohyoid muscle
Auricular cartilage
Mastoid cells
Medulla oblongata
Internal carotid artery
Facial nerve (CN VII)
Internal jugular vein
Vagus nerve (CN X)
Hypoglossal nerve (CN XII)
Accessory nerve (CN XI)
C. Machado M.D.

Coronal section

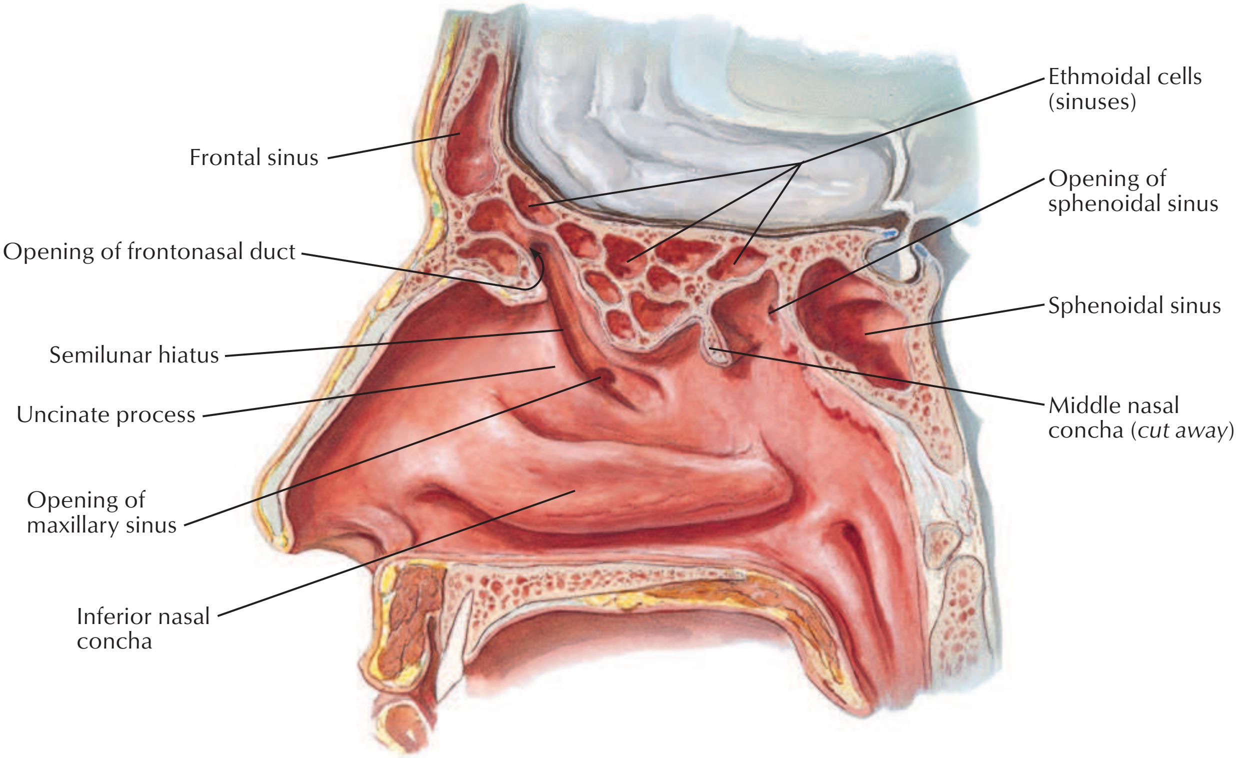

Falx cerebri
Brain
Nasal septum
Middle nasal concha
Middle nasal meatus
Maxillary sinus
Inferior nasal concha
Inferior nasal meatus
Palatine process of maxillary bone
Oral cavity
Genioglossus muscle
Mylohyoid muscle
Geniohyoid muscle
Olfactory bulbs
Frontal sinus
Ethmoidal cells
Lacrimal gland
Opening of maxillary sinus
Infraorbital
Zygomatic
Alveolar and membrane
Recesses of maxillary sinus
Alveolar process of maxillary bone
Buccinator muscle
Body of tongue
Sublingual gland
Mandible (body)
Anterior belly of digastric muscle

Transverse section

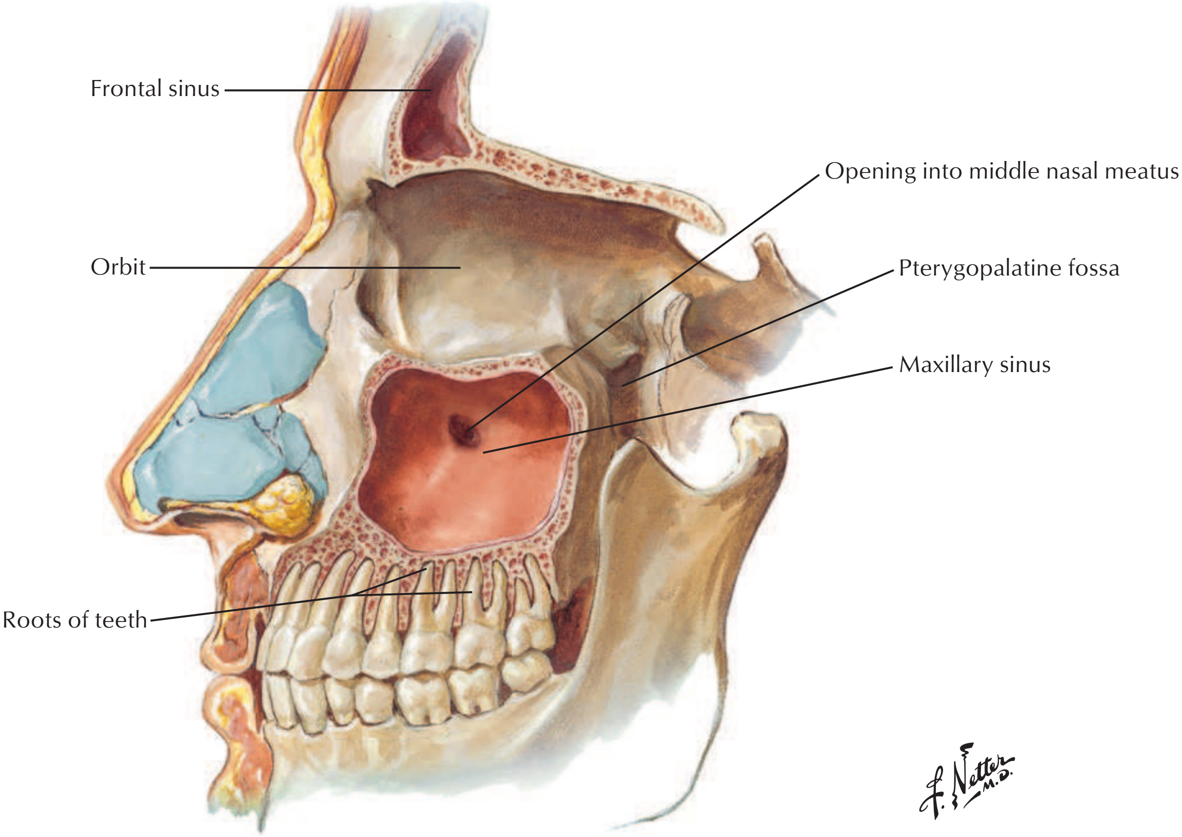

Nasal bone
Lacrimal bone
Ethmoidal cells
Eyeball
Zygomatic bone
Retrobulbar fat
Sphenoidal sinuses
Optic chiasm
Temporal lobe
Infundibular recess of 3rd ventricle
Mammillary bodies
Cerebral peduncle
Cerebral aqueduct
Vermis
Nasal septum
Medial wall of orbit
Medial rectus muscle
Lateral rectus muscle
Optic nerve (CN II)
Temporalis muscle
Optic tract
Interpeduncular fossa
C.Machado M.D.

Paranasal Sinuses: Parasagittal Views

See also **Plate 43**

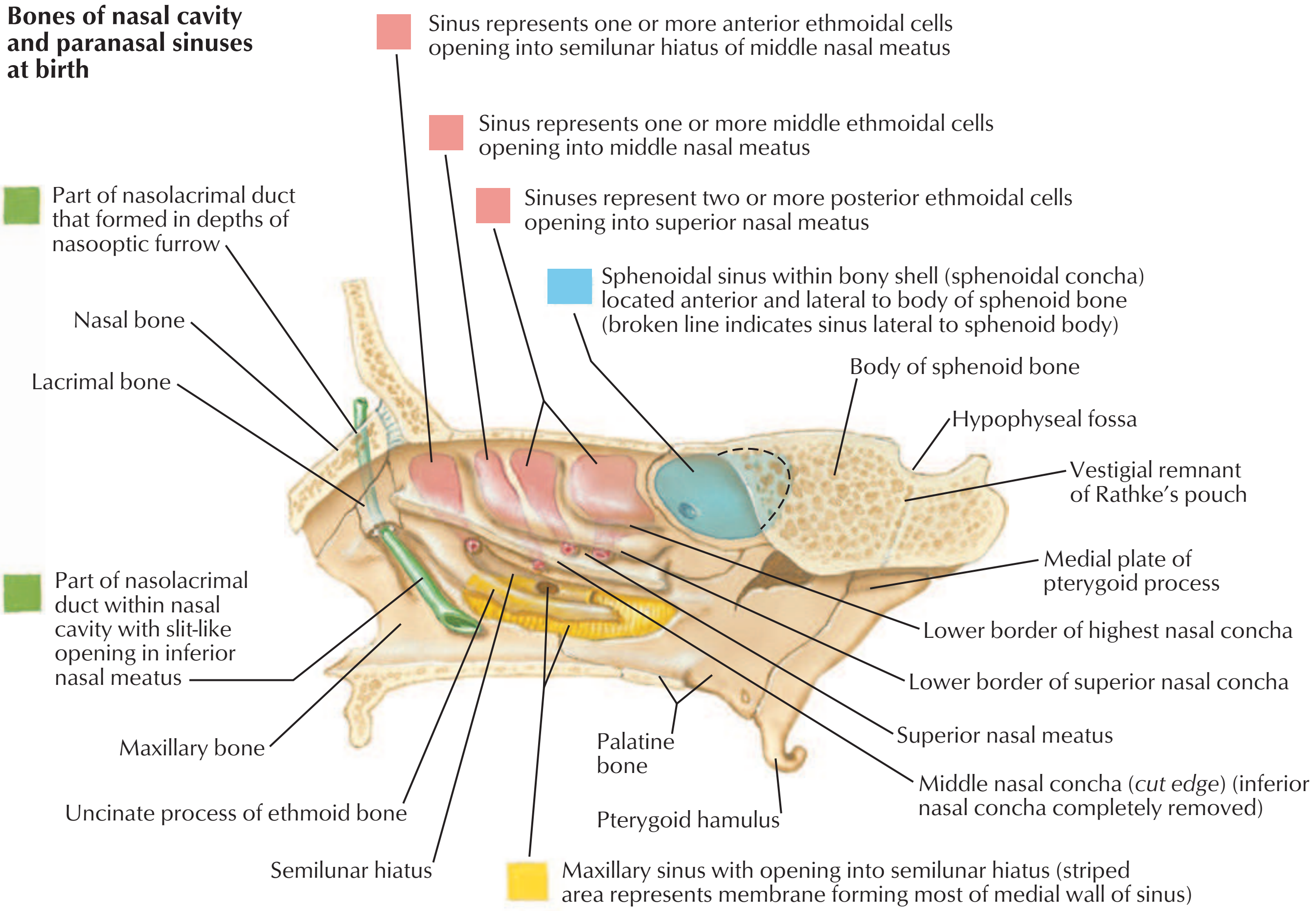


Frontal sinus
Opening of frontonasal duct
Semilunar hiatus
Uncinate process
Opening of maxillary sinus
Inferior nasal concha
Ethmoidal cells (sinuses)
Opening of sphenoidal sinus
Sphenoidal sinus
Middle nasal concha (*cut away*)

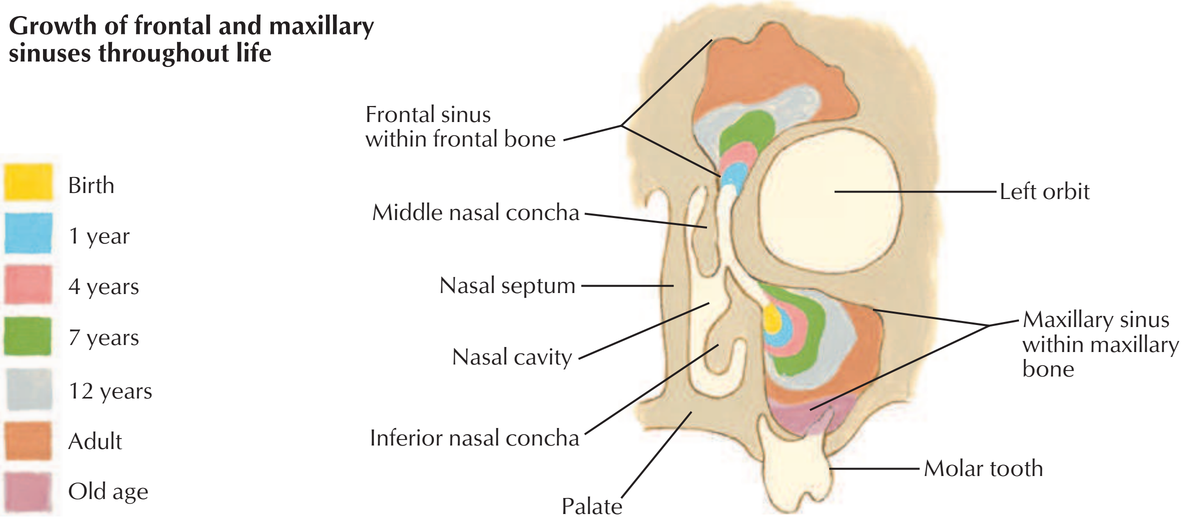


Frontal sinus
Orbit
Roots of teeth
Opening into middle nasal meatus
Pterygopalatine fossa
Maxillary sinus

Bones of nasal cavity and paranasal sinuses at birth


🟥 Sinus represents one or more anterior ethmoidal cells opening into semilunar hiatus of middle nasal meatus
🟥 Sinus represents one or more middle ethmoidal cells opening into middle nasal meatus
🟥 Sinuses represent two or more posterior ethmoidal cells opening into superior nasal meatus
🟦 Sphenoidal sinus within bony shell (sphenoidal concha) located anterior and lateral to body of sphenoid bone (broken line indicates sinus lateral to sphenoid body)
🟩 Part of nasolacrimal duct that formed in depths of nasooptic furrow
Nasal bone
Lacrimal bone
Body of sphenoid bone
Hypophyseal fossa
Vestigial remnant of Rathke's pouch
Medial plate of pterygoid process
🟩 Part of nasolacrimal duct within nasal cavity with slit-like opening in inferior nasal meatus
Lower border of highest nasal concha
Lower border of superior nasal concha
Superior nasal meatus
Maxillary bone
Palatine bone
Middle nasal concha (*cut edge*) (inferior nasal concha completely removed)
Uncinate process of ethmoid bone
Pterygoid hamulus
Semilunar hiatus
🟨 Maxillary sinus with opening into semilunar hiatus (striped area represents membrane forming most of medial wall of sinus)

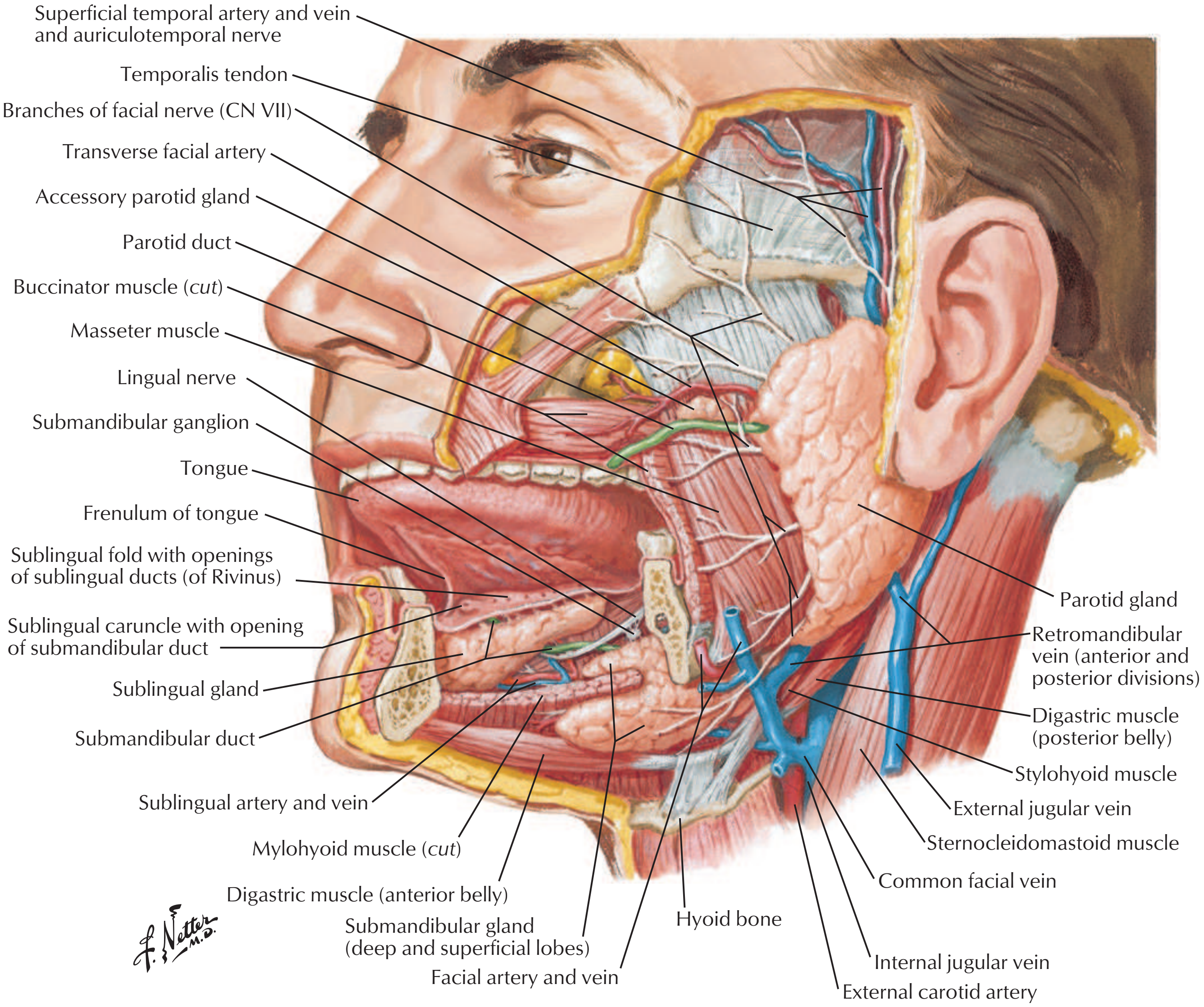
Growth of frontal and maxillary sinuses throughout life


🟨 Birth
🟦 1 year
🟥 4 years
🟩 7 years
⬜ 12 years
🟧 Adult
🟪 Old age
Frontal sinus within frontal bone
Middle nasal concha
Left orbit
Nasal septum
Maxillary sinus within maxillary bone
Nasal cavity
Inferior nasal concha
Molar tooth
Palate

F. Netter M.D.

Salivary Glands

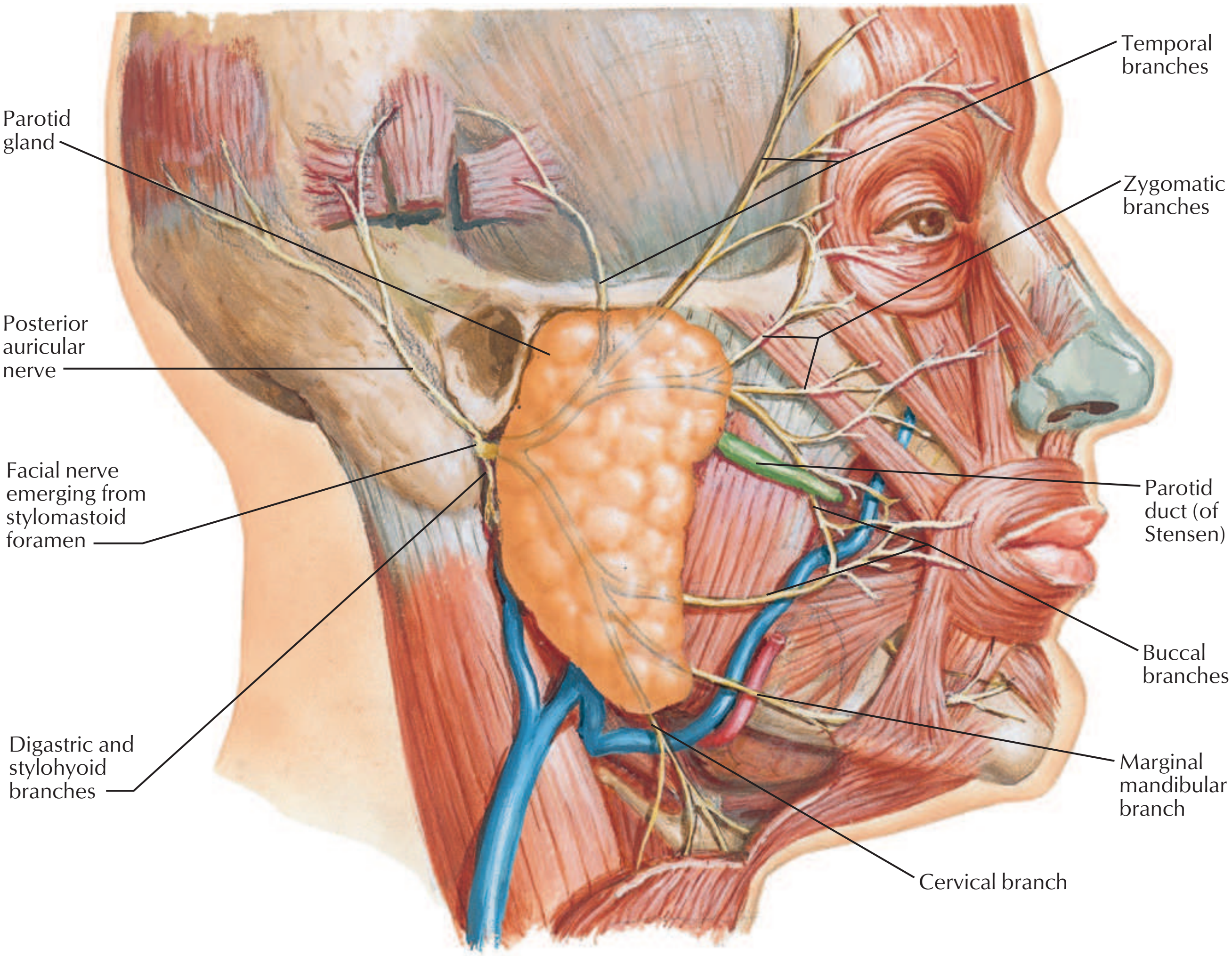
See also **Plates 54**, **144**, **145**

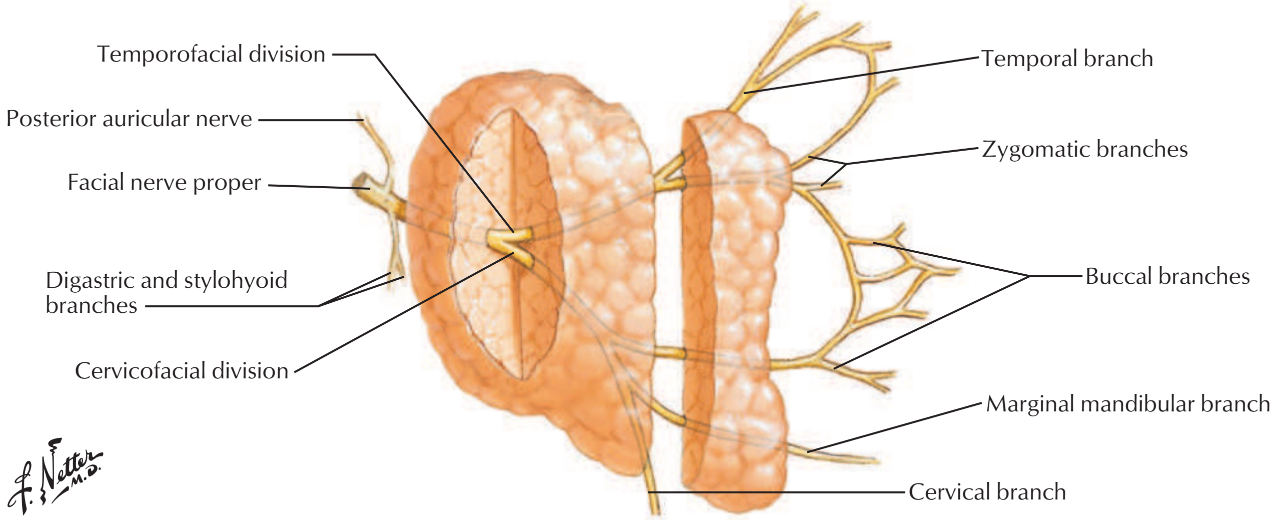


Superficial temporal artery and vein and auriculotemporal nerve
Temporalis tendon
Branches of facial nerve (CN VII)
Transverse facial artery
Accessory parotid gland
Parotid duct
Buccinator muscle (*cut*)
Masseter muscle
Lingual nerve
Submandibular ganglion
Tongue
Frenulum of tongue
Sublingual fold with openings of sublingual ducts (of Rivinus)
Sublingual caruncle with opening of submandibular duct
Sublingual gland
Submandibular duct
Sublingual artery and vein
Mylohyoid muscle (*cut*)
Digastric muscle (anterior belly)
Submandibular gland (deep and superficial lobes)
Facial artery and vein
Hyoid bone
Parotid gland
Retromandibular vein (anterior and posterior divisions)
Digastric muscle (posterior belly)
Stylohyoid muscle
External jugular vein
Sternocleidomastoid muscle
Common facial vein
Internal jugular vein
External carotid artery

Facial Nerve Branches and Parotid Gland

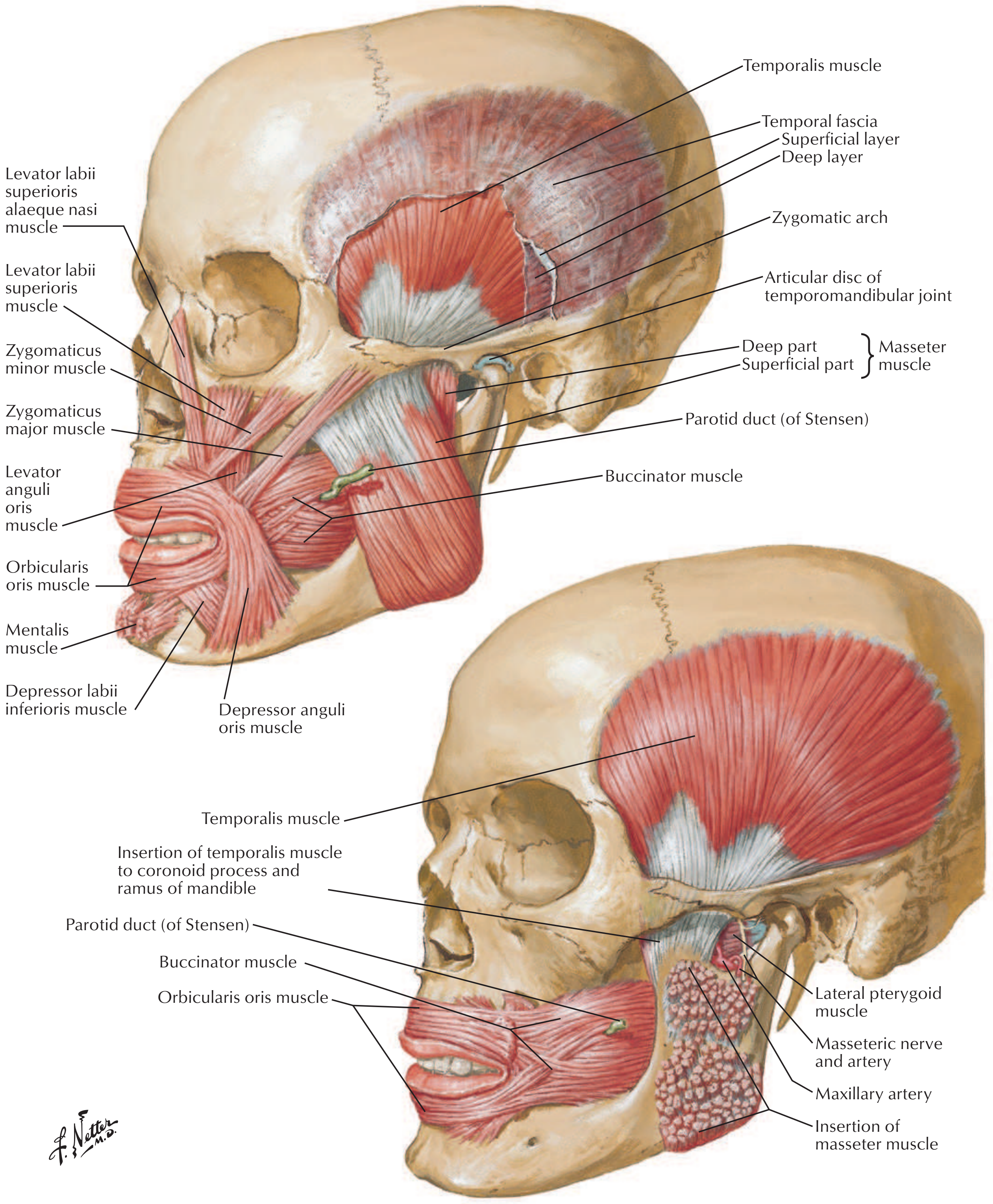
See also **Plates 53**, **134**


Parotid gland
Posterior auricular nerve
Facial nerve emerging from stylomastoid foramen
Digastric and stylohyoid branches
Temporal branches
Zygomatic branches
Parotid duct (of Stensen)
Buccal branches
Marginal mandibular branch
Cervical branch


Temporofacial division
Posterior auricular nerve
Facial nerve proper
Digastric and stylohyoid branches
Cervicofacial division
Temporal branch
Zygomatic branches
Buccal branches
Marginal mandibular branch
Cervical branch

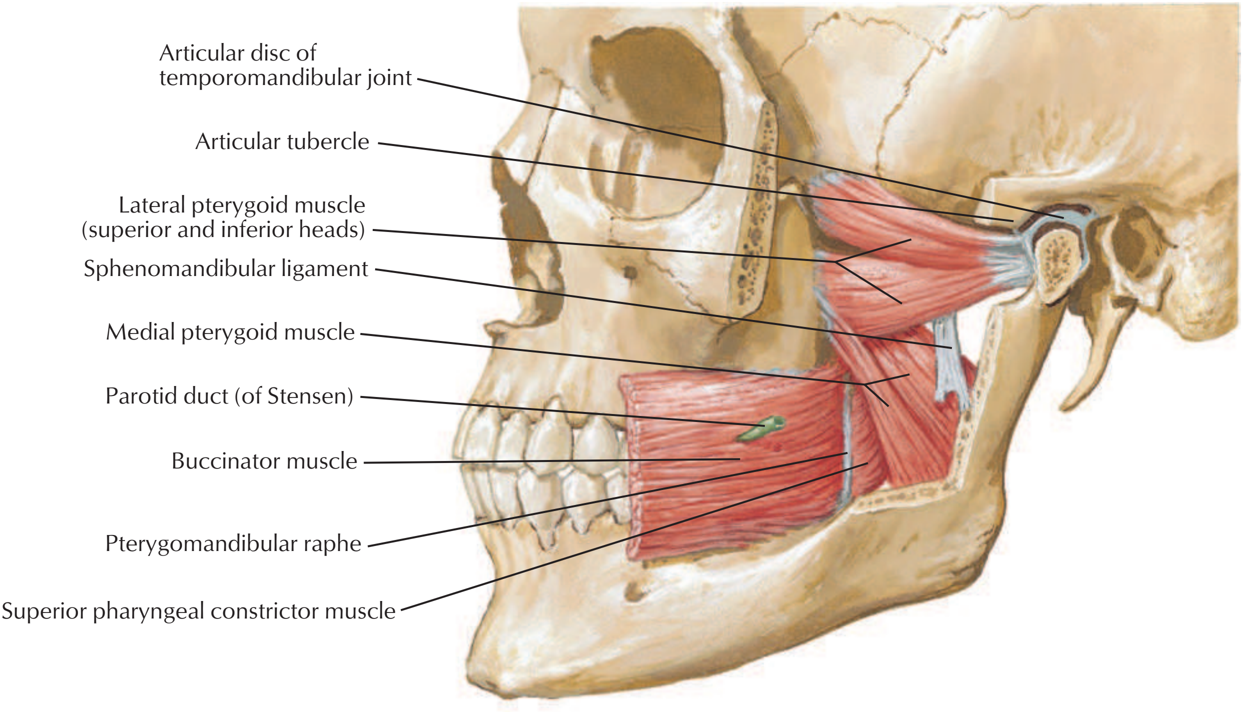
Muscles Involved in Mastication

For facial muscles see Plate 31

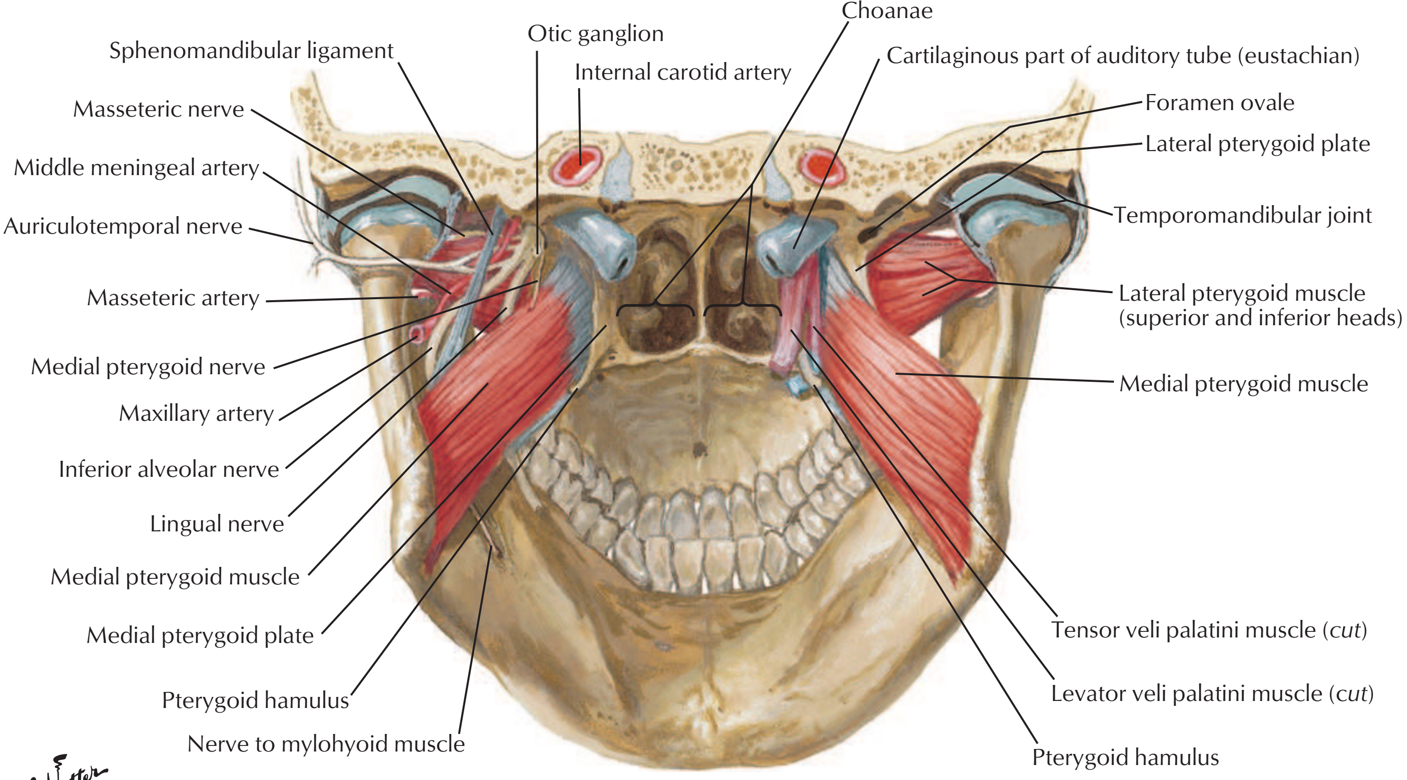

Levator labii superioris alaeque nasi muscle
Levator labii superioris muscle
Zygomaticus minor muscle
Zygomaticus major muscle
Levator anguli oris muscle
Orbicularis oris muscle
Mentalis muscle
Depressor labii inferioris muscle
Depressor anguli oris muscle
Temporalis muscle
Temporal fascia
Superficial layer
Deep layer
Zygomatic arch
Articular disc of temporomandibular joint
Deep part
Superficial part
Masseter muscle
Parotid duct (of Stensen)
Buccinator muscle
Temporalis muscle
Insertion of temporalis muscle to coronoid process and ramus of mandible
Parotid duct (of Stensen)
Buccinator muscle
Orbicularis oris muscle
Lateral pterygoid muscle
Masseteric nerve and artery
Maxillary artery
Insertion of masseter muscle

See also Plates 55, 59

Lateral view


Articular disc of temporomandibular joint
Articular tubercle
Lateral pterygoid muscle (superior and inferior heads)
Sphenomandibular ligament
Medial pterygoid muscle
Parotid duct (of Stensen)
Buccinator muscle
Pterygomandibular raphe
Superior pharyngeal constrictor muscle

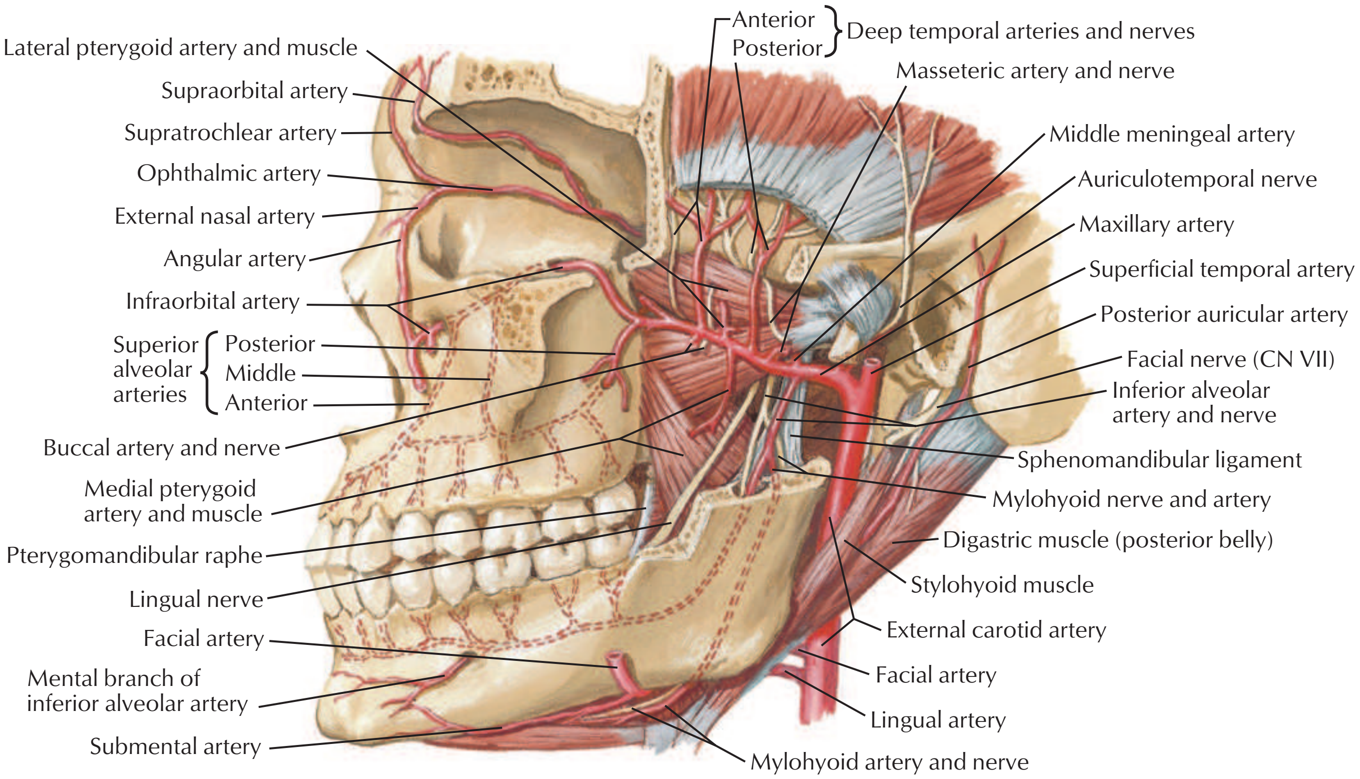
Posterior view


Sphenomandibular ligament
Otic ganglion
Internal carotid artery
Choanae
Cartilaginous part of auditory tube (eustachian)
Foramen ovale
Lateral pterygoid plate
Temporomandibular joint
Lateral pterygoid muscle (superior and inferior heads)
Medial pterygoid muscle
Masseteric nerve
Middle meningeal artery
Auriculotemporal nerve
Masseteric artery
Medial pterygoid nerve
Maxillary artery
Inferior alveolar nerve
Lingual nerve
Medial pterygoid muscle
Medial pterygoid plate
Pterygoid hamulus
Nerve to mylohyoid muscle
Tensor veli palatini muscle (*cut*)
Levator veli palatini muscle (*cut*)
Pterygoid hamulus

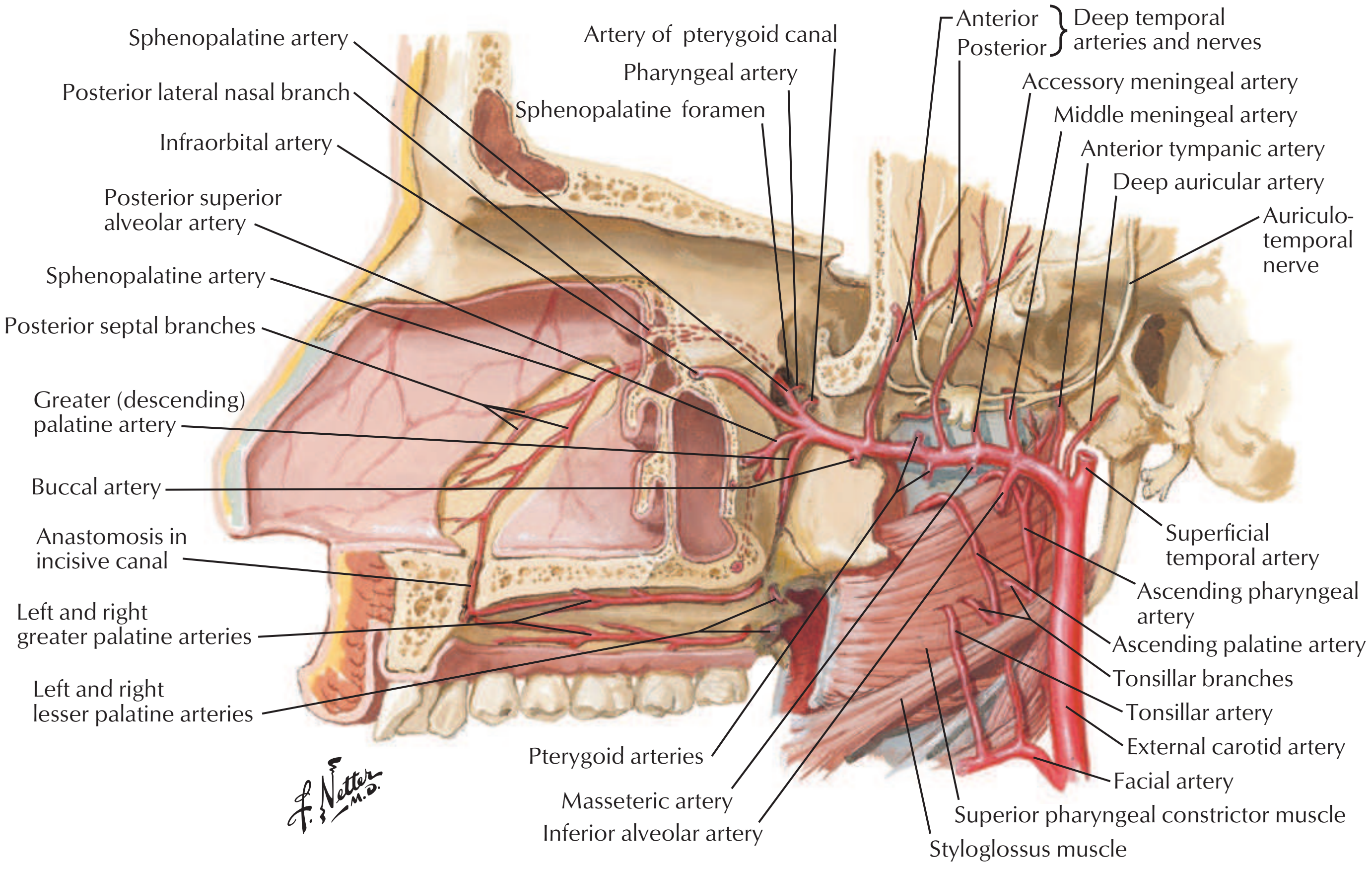
F. Netter M.D.

Maxillary Artery

See also **Plates 63, 83**



Lateral pterygoid artery and muscle
Supraorbital artery
Supratrochlear artery
Ophthalmic artery
External nasal artery
Angular artery
Infraorbital artery
Superior alveolar arteries
Posterior
Middle
Anterior
Buccal artery and nerve
Medial pterygoid artery and muscle
Pterygomandibular raphe
Lingual nerve
Facial artery
Mental branch of inferior alveolar artery
Submental artery
Anterior
Posterior
Deep temporal arteries and nerves
Masseteric artery and nerve
Middle meningeal artery
Auriculotemporal nerve
Maxillary artery
Superficial temporal artery
Posterior auricular artery
Facial nerve (CN VII)
Inferior alveolar artery and nerve
Sphenomandibular ligament
Mylohyoid nerve and artery
Digastric muscle (posterior belly)
Stylohyoid muscle
External carotid artery
Facial artery
Lingual artery
Mylohyoid artery and nerve

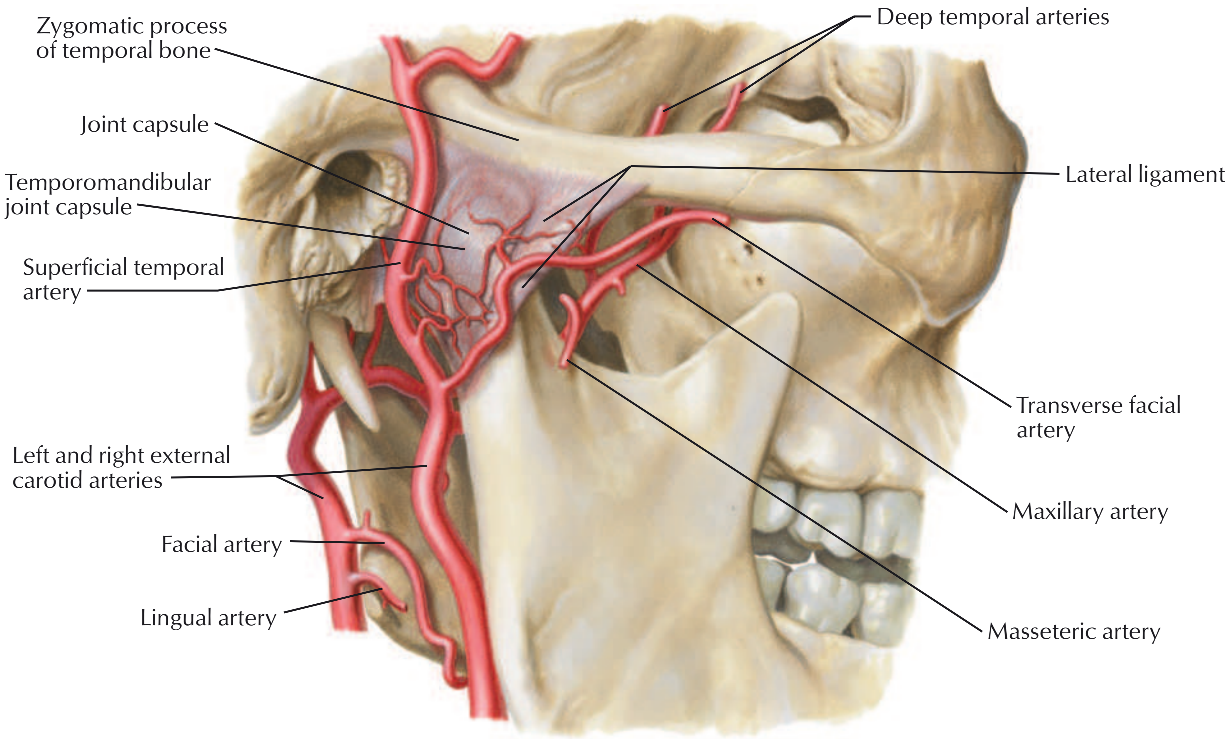


Sphenopalatine artery
Posterior lateral nasal branch
Infraorbital artery
Posterior superior alveolar artery
Sphenopalatine artery
Posterior septal branches
Greater (descending) palatine artery
Buccal artery
Anastomosis in incisive canal
Left and right greater palatine arteries
Left and right lesser palatine arteries
Artery of pterygoid canal
Pharyngeal artery
Sphenopalatine foramen
Anterior
Posterior
Deep temporal arteries and nerves
Accessory meningeal artery
Middle meningeal artery
Anterior tympanic artery
Deep auricular artery
Auriculo-temporal nerve
Superficial temporal artery
Ascending pharyngeal artery
Ascending palatine artery
Tonsillar branches
Tonsillar artery
External carotid artery
Facial artery
Superior pharyngeal constrictor muscle
Styloglossus muscle
Pterygoid arteries
Masseteric artery
Inferior alveolar artery

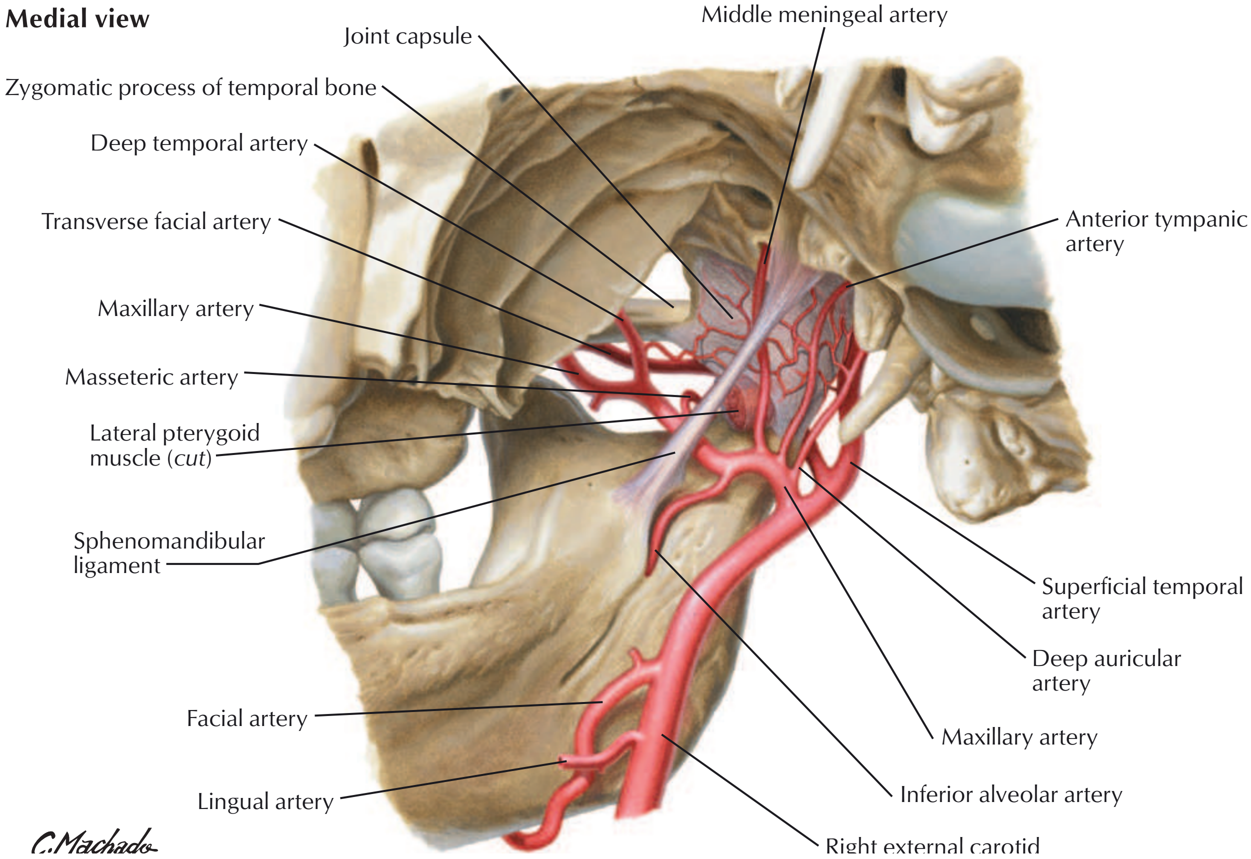
Proximal Maxillary and Superficial Temporal Arteries

See also Plates 57, 59, 63

Lateral view


Zygomatic process of temporal bone
Joint capsule
Temporomandibular joint capsule
Superficial temporal artery
Left and right external carotid arteries
Facial artery
Lingual artery
Deep temporal arteries
Lateral ligament
Transverse facial artery
Maxillary artery
Masseteric artery

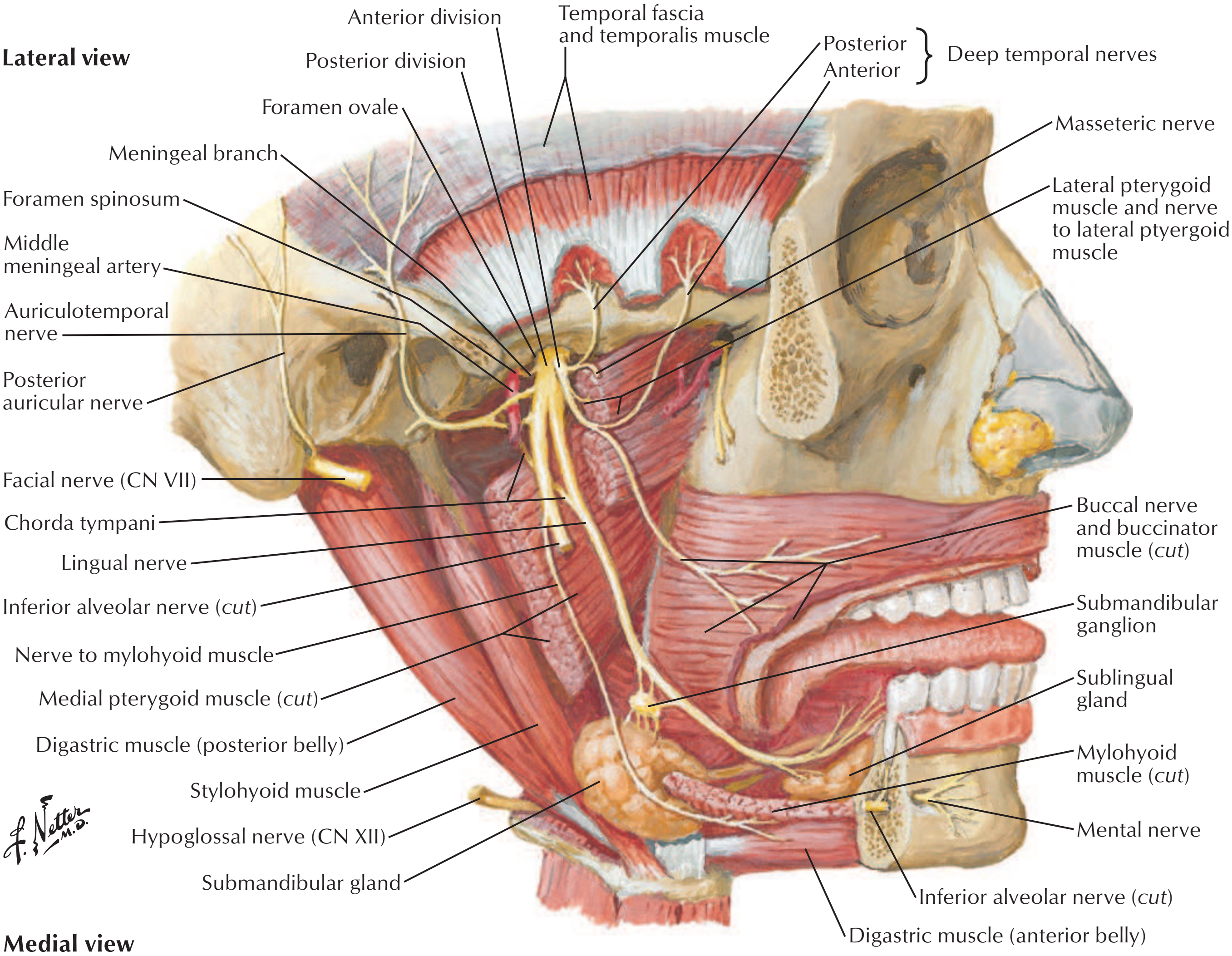
Medial view


Joint capsule
Middle meningeal artery
Zygomatic process of temporal bone
Deep temporal artery
Transverse facial artery
Maxillary artery
Masseteric artery
Lateral pterygoid muscle (cut)
Sphenomandibular ligament
Facial artery
Lingual artery
Anterior tympanic artery
Superficial temporal artery
Deep auricular artery
Maxillary artery
Inferior alveolar artery
Right external carotid
C.Machado

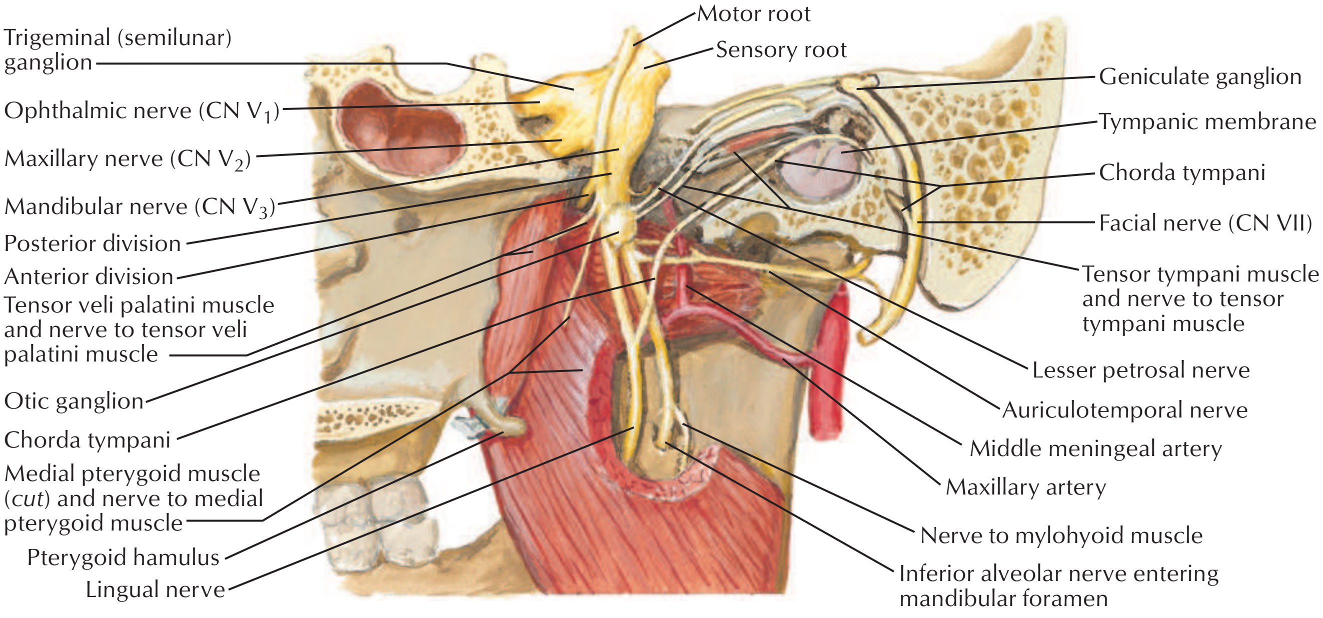
Mandibular Nerve (CN V_3)

See also Plates 82, 133

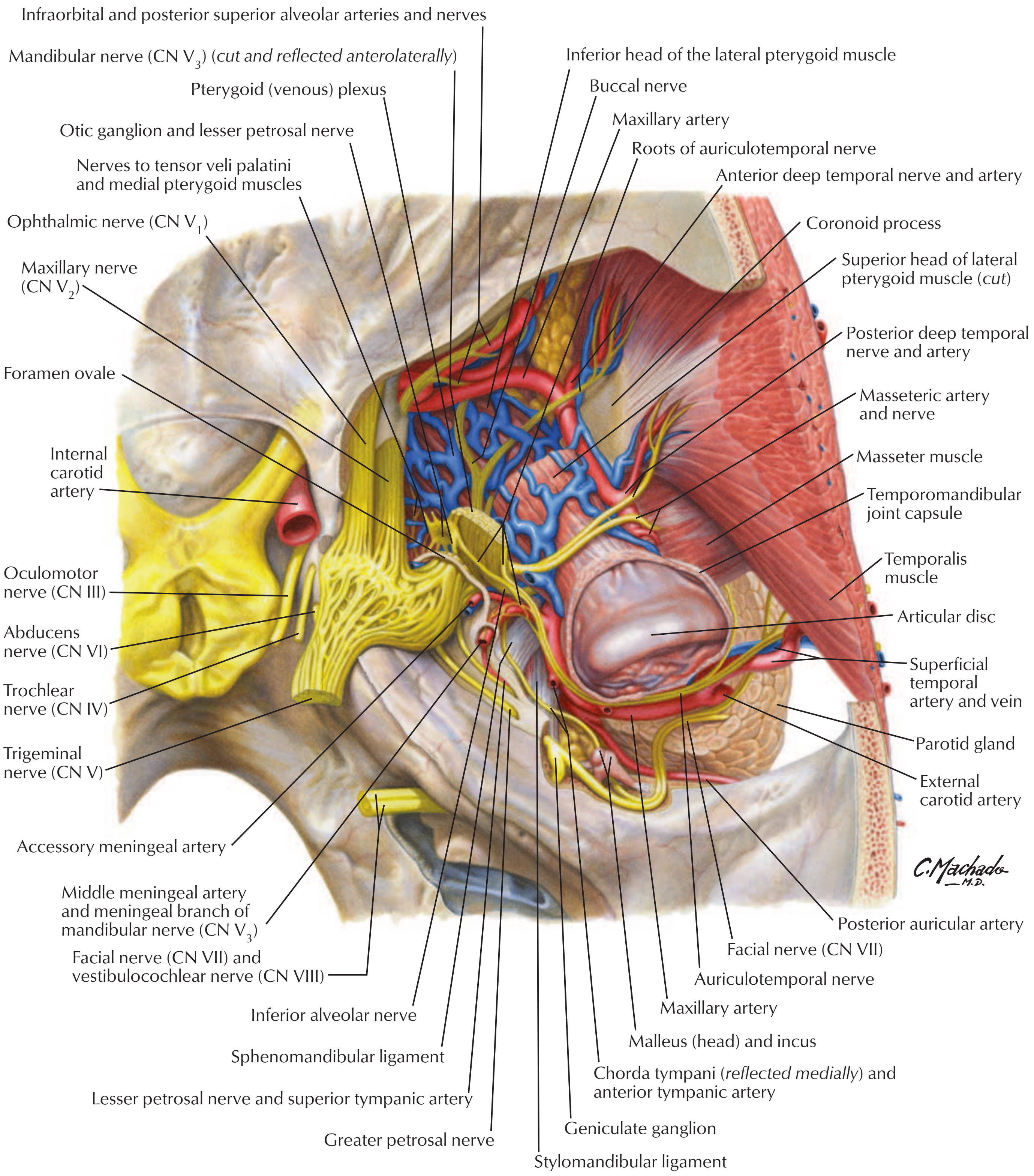
Lateral view


Anterior division
Temporal fascia and temporalis muscle
Posterior division
Posterior
Anterior
Deep temporal nerves
Foramen ovale
Masseteric nerve
Meningeal branch
Lateral pterygoid muscle and nerve to lateral ptyergoid muscle
Foramen spinosum
Middle meningeal artery
Auriculotemporal nerve
Posterior auricular nerve
Facial nerve (CN VII)
Buccal nerve and buccinator muscle (cut)
Chorda tympani
Lingual nerve
Inferior alveolar nerve (cut)
Submandibular ganglion
Nerve to mylohyoid muscle
Medial pterygoid muscle (cut)
Sublingual gland
Digastric muscle (posterior belly)
Mylohyoid muscle (cut)
Stylohyoid muscle
Mental nerve
Hypoglossal nerve (CN XII)
Submandibular gland
Inferior alveolar nerve (cut)
Digastric muscle (anterior belly)

Medial view

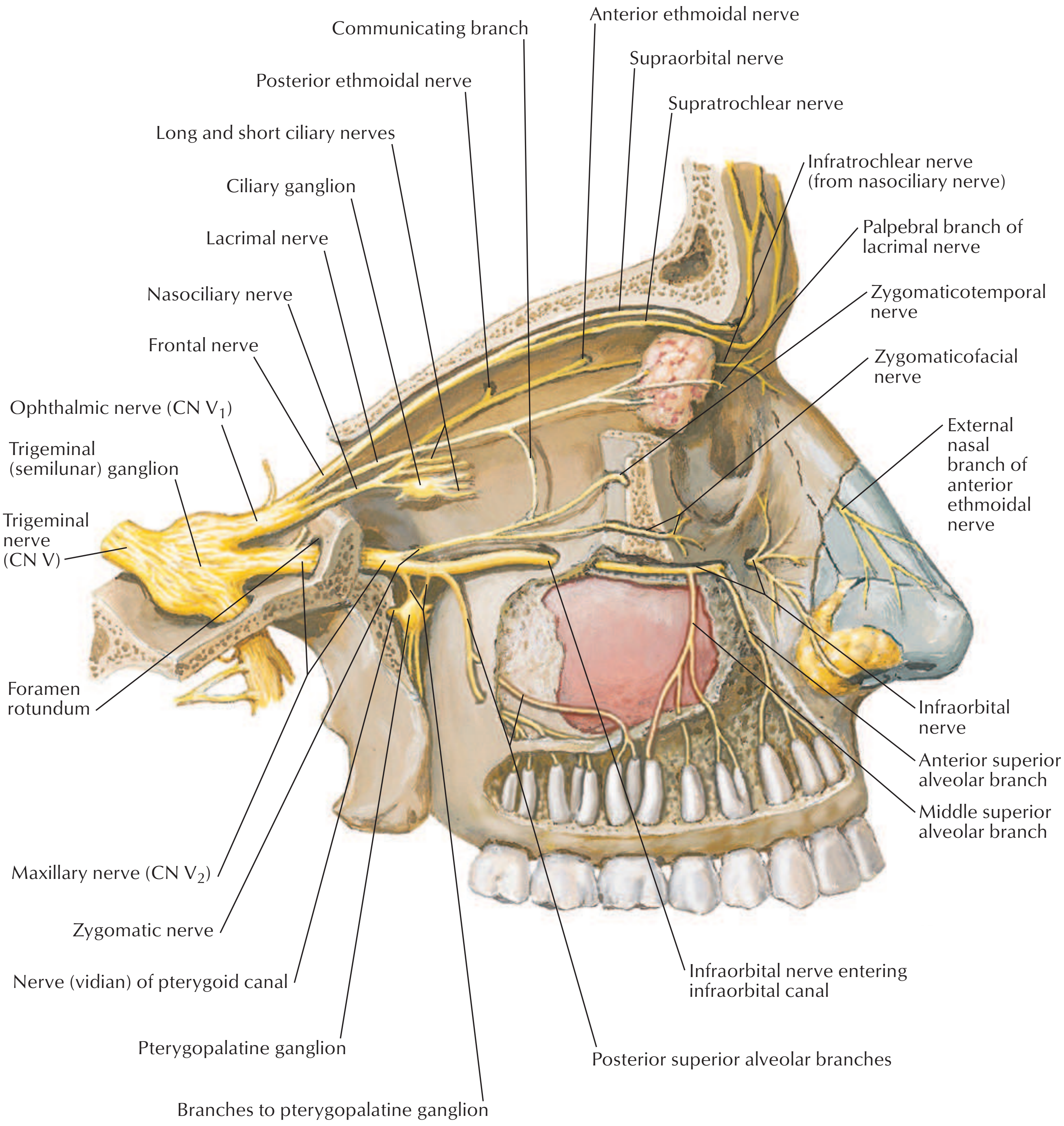

Motor root
Sensory root
Trigeminal (semilunar) ganglion
Geniculate ganglion
Ophthalmic nerve (CN V1)
Tympanic membrane
Maxillary nerve (CN V2)
Chorda tympani
Mandibular nerve (CN V3)
Facial nerve (CN VII)
Posterior division
Anterior division
Tensor tympani muscle and nerve to tensor tympani muscle
Tensor veli palatini muscle and nerve to tensor veli palatini muscle
Lesser petrosal nerve
Otic ganglion
Auriculotemporal nerve
Chorda tympani
Middle meningeal artery
Medial pterygoid muscle (cut) and nerve to medial pterygoid muscle
Maxillary artery
Nerve to mylohyoid muscle
Pterygoid hamulus
Lingual nerve
Inferior alveolar nerve entering mandibular foramen

See also Plates 57-59, 63, 64, 115


Infraorbital and posterior superior alveolar arteries and nerves
Mandibular nerve (CN V_3) (*cut and reflected anterolaterally*)
Pterygoid (venous) plexus
Otic ganglion and lesser petrosal nerve
Nerves to tensor veli palatini and medial pterygoid muscles
Ophthalmic nerve (CN V_1)
Maxillary nerve (CN V_2)
Foramen ovale
Internal carotid artery
Oculomotor nerve (CN III)
Abducens nerve (CN VI)
Trochlear nerve (CN IV)
Trigeminal nerve (CN V)
Accessory meningeal artery
Middle meningeal artery and meningeal branch of mandibular nerve (CN V_3)
Facial nerve (CN VII) and vestibulocochlear nerve (CN VIII)
Inferior alveolar nerve
Sphenomandibular ligament
Lesser petrosal nerve and superior tympanic artery
Greater petrosal nerve
Stylomandibular ligament
Geniculate ganglion
Chorda tympani (*reflected medially*) and anterior tympanic artery
Malleus (head) and incus
Maxillary artery
Auriculotemporal nerve
Facial nerve (CN VII)
Posterior auricular artery
External carotid artery
Parotid gland
Superficial temporal artery and vein
Articular disc
Temporalis muscle
Temporomandibular joint capsule
Masseter muscle
Masseteric artery and nerve
Posterior deep temporal nerve and artery
Superior head of lateral pterygoid muscle (*cut*)
Coronoid process
Anterior deep temporal nerve and artery
Roots of auriculotemporal nerve
Maxillary artery
Buccal nerve
Inferior head of the lateral pterygoid muscle
C.Machado M.D.

Ophthalmic (CN V_1) and Maxillary (CN V_2) Nerves

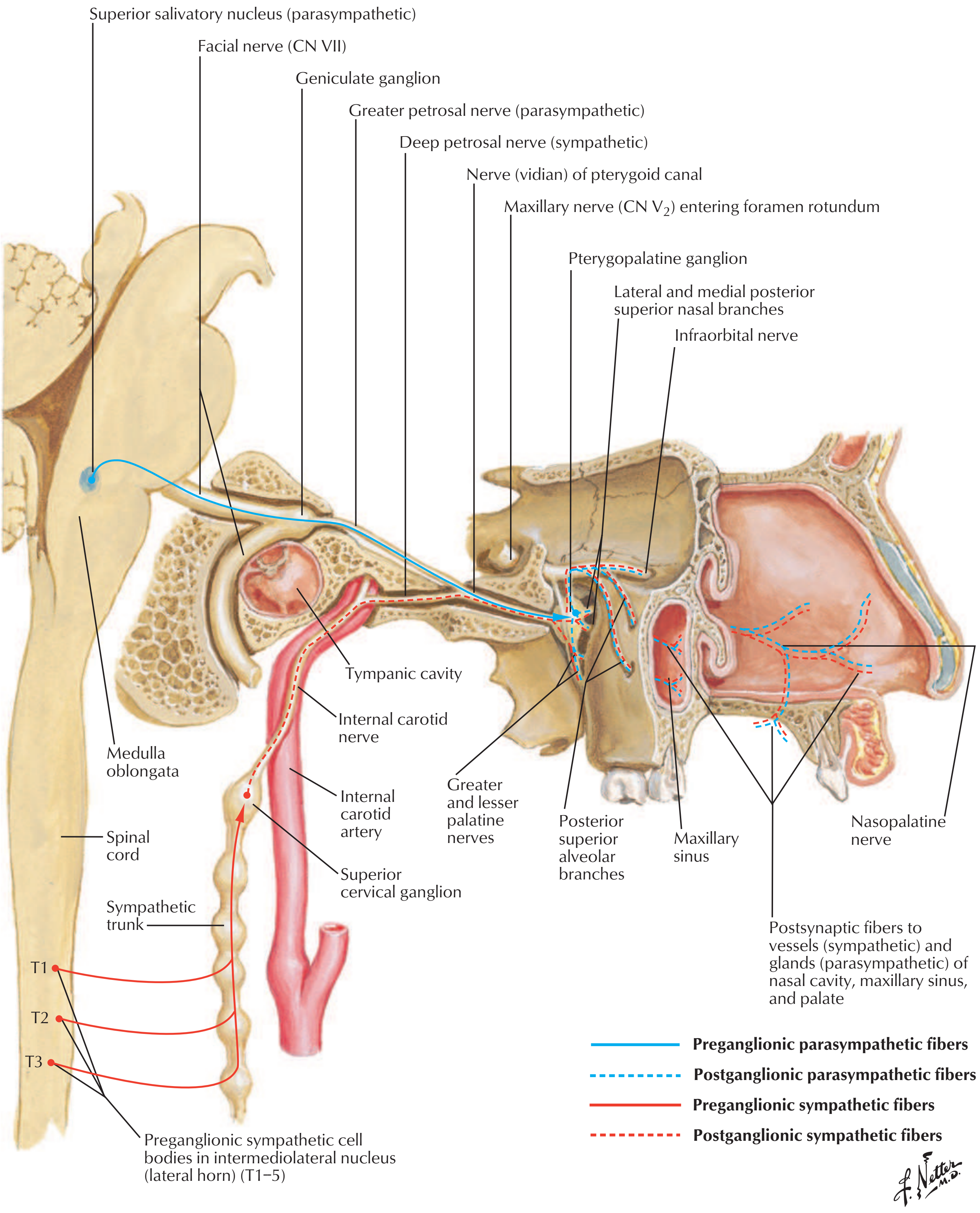
See also Plates 63, 66



Communicating branch
Anterior ethmoidal nerve
Supraorbital nerve
Posterior ethmoidal nerve
Supratrochlear nerve
Long and short ciliary nerves
Infratrochlear nerve (from nasociliary nerve)
Ciliary ganglion
Palpebral branch of lacrimal nerve
Lacrimal nerve
Zygomaticotemporal nerve
Nasociliary nerve
Zygomaticofacial nerve
Frontal nerve
Ophthalmic nerve (CN V_1)
External nasal branch of anterior ethmoidal nerve
Trigeminal (semilunar) ganglion
Trigeminal nerve (CN V)
Foramen rotundum
Infraorbital nerve
Anterior superior alveolar branch
Middle superior alveolar branch
Maxillary nerve (CN V_2)
Zygomatic nerve
Nerve (vidian) of pterygoid canal
Infraorbital nerve entering infraorbital canal
Pterygopalatine ganglion
Posterior superior alveolar branches
Branches to pterygopalatine ganglion

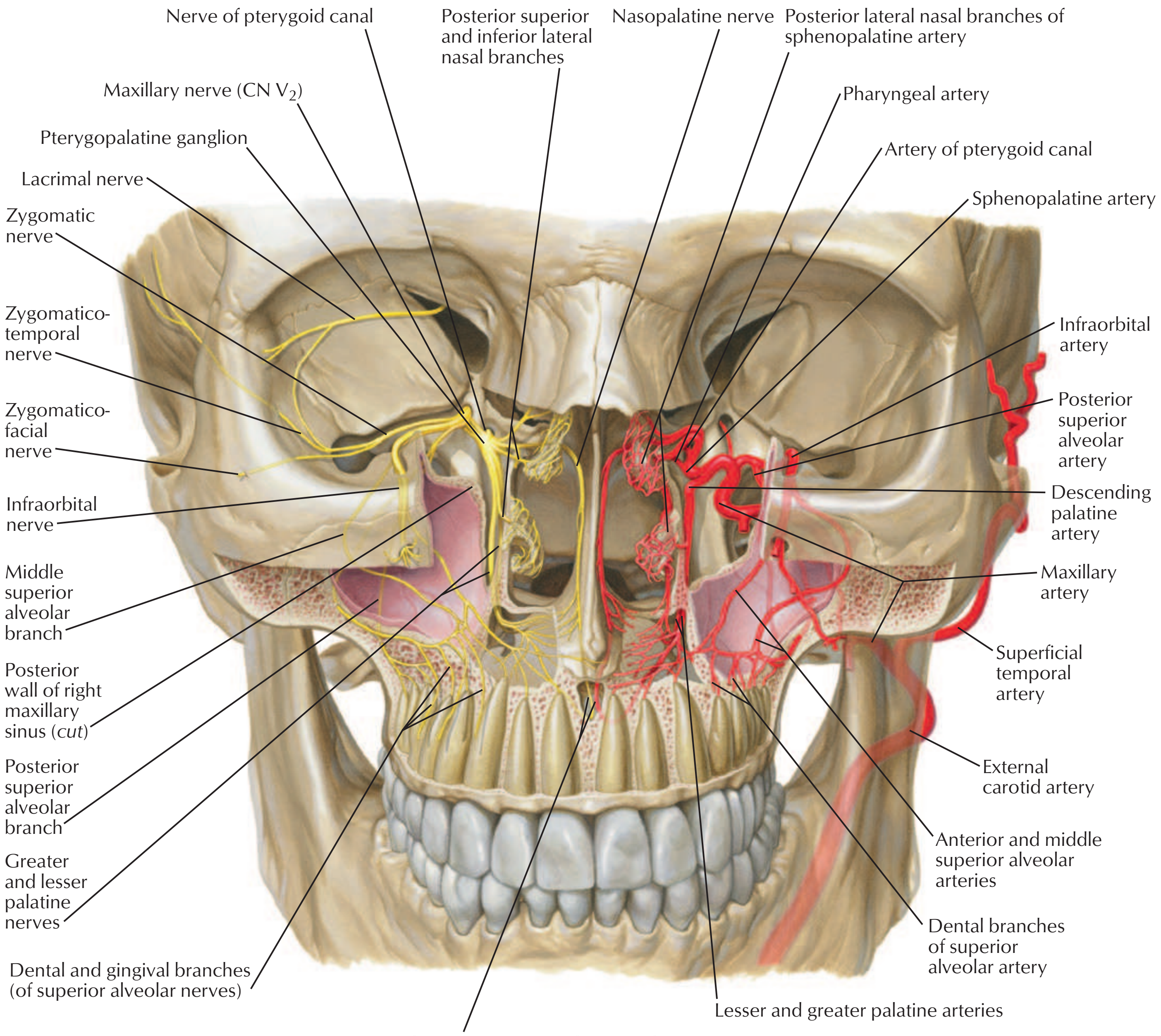
Autonomic Innervation of Nasal Cavity

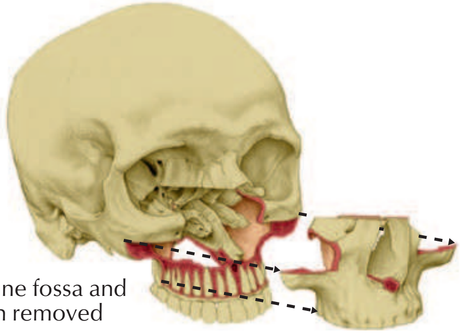
See also Plates 133, 142, 144


Superior salivatory nucleus (parasympathetic)
Facial nerve (CN VII)
Geniculate ganglion
Greater petrosal nerve (parasympathetic)
Deep petrosal nerve (sympathetic)
Nerve (vidian) of pterygoid canal
Maxillary nerve (CN V$_2$) entering foramen rotundum
Pterygopalatine ganglion
Lateral and medial posterior superior nasal branches
Infraorbital nerve
Tympanic cavity
Internal carotid nerve
Medulla oblongata
Internal carotid artery
Greater and lesser palatine nerves
Posterior superior alveolar branches
Maxillary sinus
Nasopalatine nerve
Spinal cord
Superior cervical ganglion
Sympathetic trunk
T1
T2
T3
Preganglionic sympathetic cell bodies in intermediolateral nucleus (lateral horn) (T1–5)
Postsynaptic fibers to vessels (sympathetic) and glands (parasympathetic) of nasal cavity, maxillary sinus, and palate
Preganglionic parasympathetic fibers
Postganglionic parasympathetic fibers
Preganglionic sympathetic fibers
Postganglionic sympathetic fibers
F. Netter M.D.

Nerves and Arteries of the Deep Face

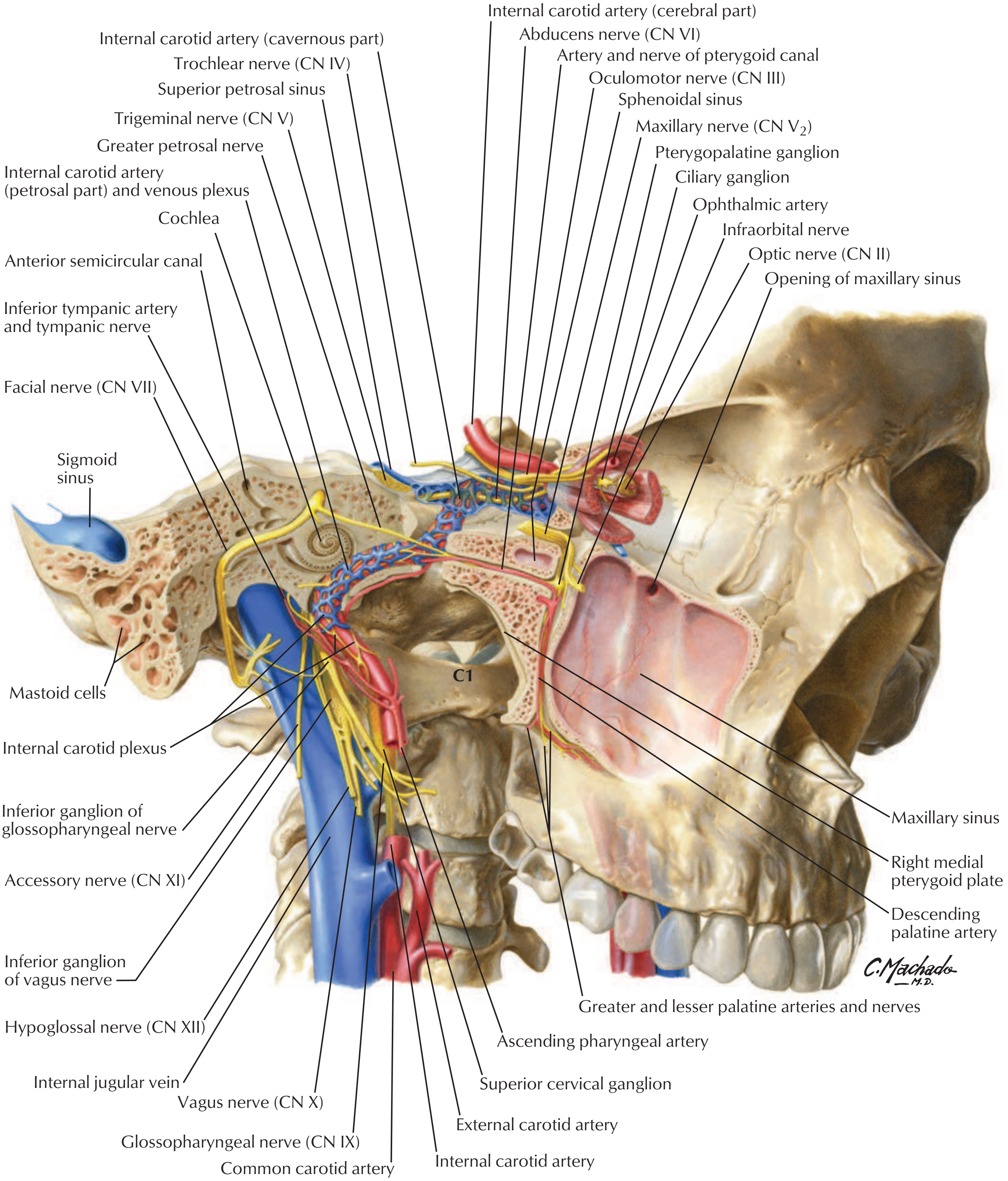
See also **Plates 46, 48, 61**


Nerve of pterygoid canal
Posterior superior and inferior lateral nasal branches
Nasopalatine nerve
Posterior lateral nasal branches of sphenopalatine artery
Maxillary nerve (CN V$_2$)
Pharyngeal artery
Pterygopalatine ganglion
Artery of pterygoid canal
Lacrimal nerve
Sphenopalatine artery
Zygomatic nerve
Zygomaticotemporal nerve
Infraorbital artery
Posterior superior alveolar artery
Zygomaticofacial nerve
Descending palatine artery
Infraorbital nerve
Maxillary artery
Middle superior alveolar branch
Superficial temporal artery
Posterior wall of right maxillary sinus (*cut*)
External carotid artery
Posterior superior alveolar branch
Anterior and middle superior alveolar arteries
Greater and lesser palatine nerves
Dental branches of superior alveolar artery
Dental and gingival branches (of superior alveolar nerves)
Lesser and greater palatine arteries
Communication between greater palatine and nasopalatine nerves, and anastomosis between posterior septal branch of sphenopalatine artery and greater palatine artery in incisive canal
C.Machado M.D.

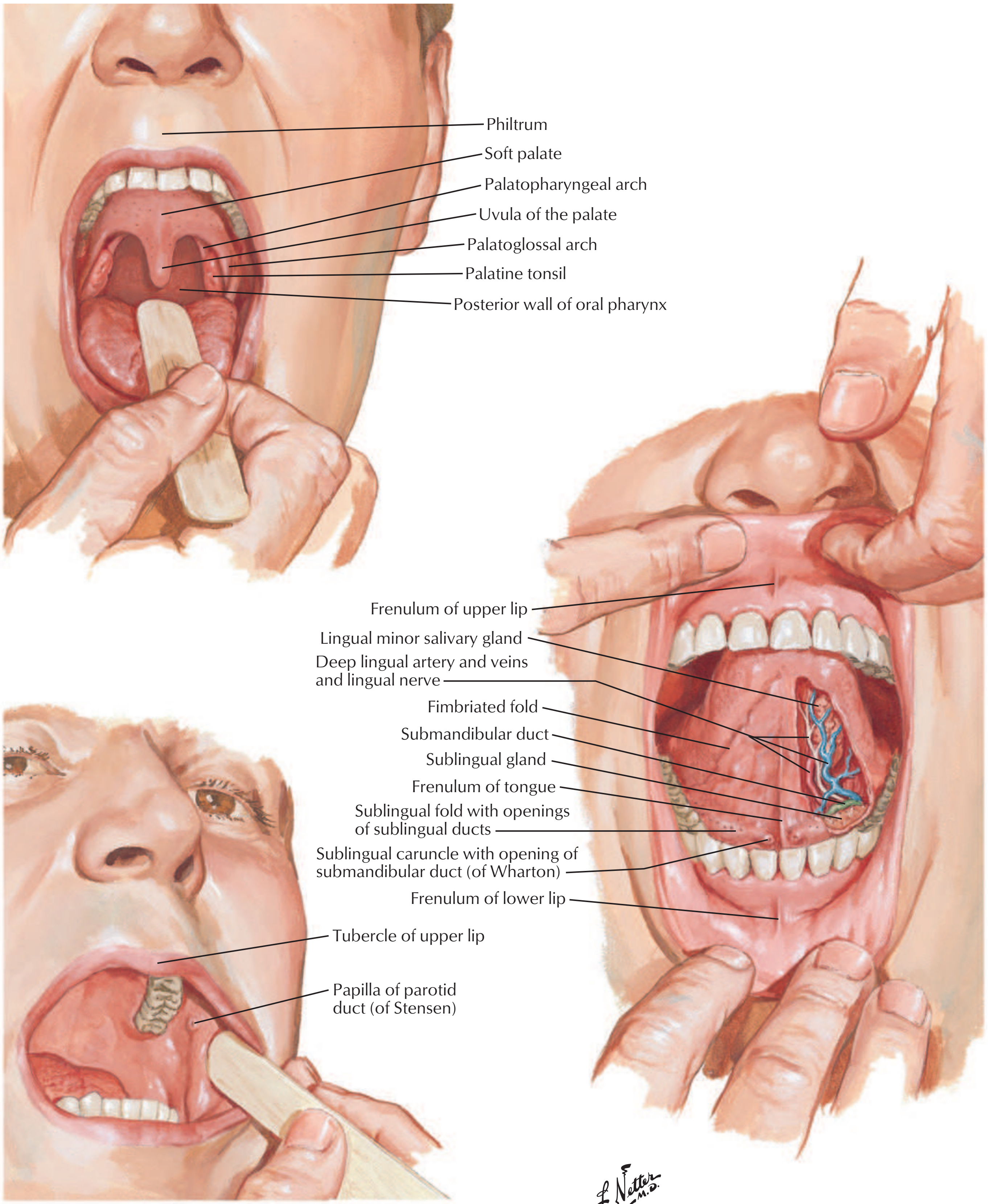


Anterior perspective of pterygopalatine fossa and nasal cavity with lower facial skeleton removed

See also Plates 115, 142, 147

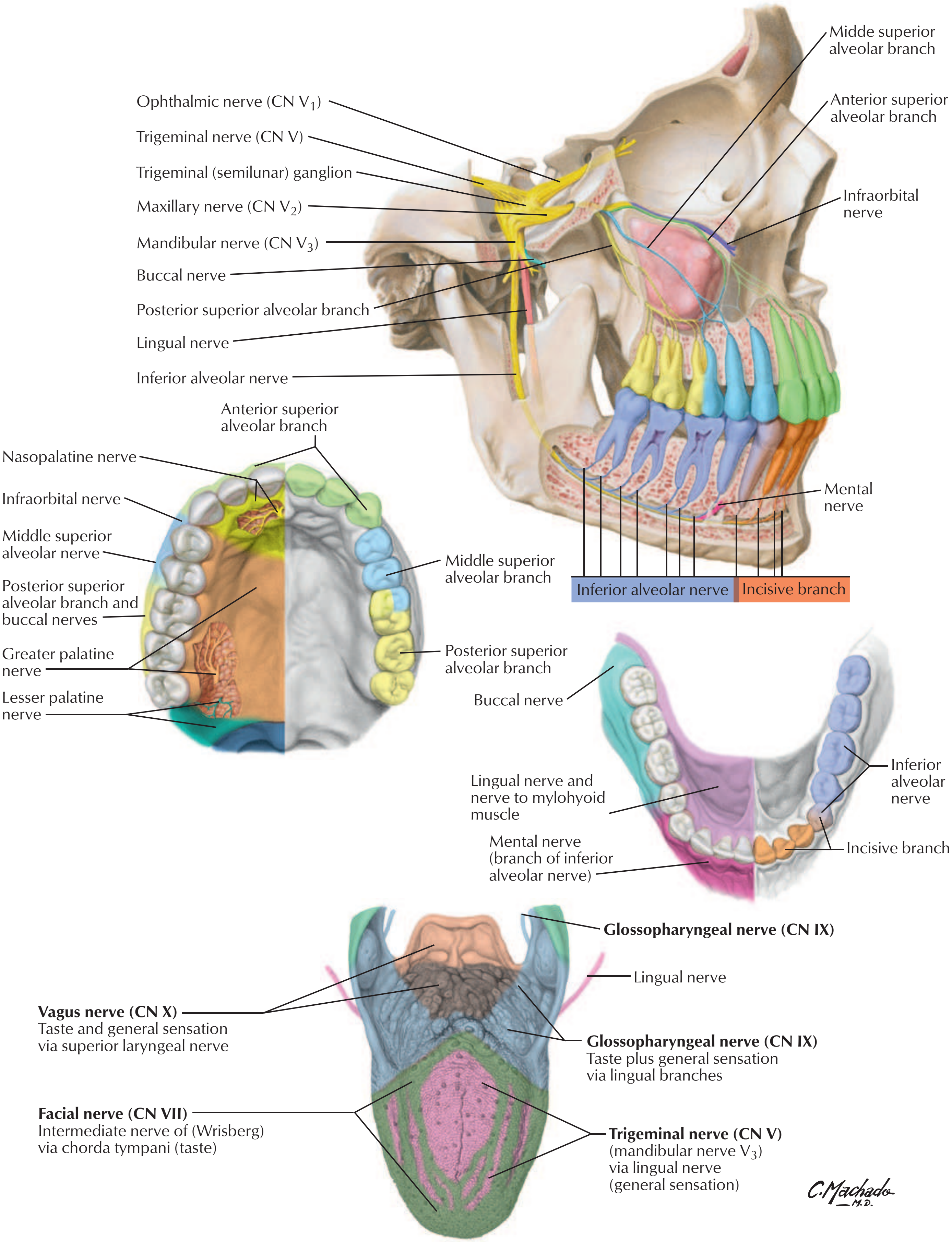

Internal carotid artery (cavernous part)
Trochlear nerve (CN IV)
Superior petrosal sinus
Trigeminal nerve (CN V)
Greater petrosal nerve
Internal carotid artery (petrosal part) and venous plexus
Cochlea
Anterior semicircular canal
Inferior tympanic artery and tympanic nerve
Facial nerve (CN VII)
Sigmoid sinus
Mastoid cells
Internal carotid plexus
Inferior ganglion of glossopharyngeal nerve
Accessory nerve (CN XI)
Inferior ganglion of vagus nerve
Hypoglossal nerve (CN XII)
Internal jugular vein
Vagus nerve (CN X)
Glossopharyngeal nerve (CN IX)
Common carotid artery
Internal carotid artery (cerebral part)
Abducens nerve (CN VI)
Artery and nerve of pterygoid canal
Oculomotor nerve (CN III)
Sphenoidal sinus
Maxillary nerve (CN V2)
Pterygopalatine ganglion
Ciliary ganglion
Ophthalmic artery
Infraorbital nerve
Optic nerve (CN II)
Opening of maxillary sinus
C1
Maxillary sinus
Right medial pterygoid plate
Descending palatine artery
C. Machado M.D.
Greater and lesser palatine arteries and nerves
Ascending pharyngeal artery
Superior cervical ganglion
External carotid artery
Internal carotid artery

Inspection of Oral Cavity


Philtrum
Soft palate
Palatopharyngeal arch
Uvula of the palate
Palatoglossal arch
Palatine tonsil
Posterior wall of oral pharynx
Frenulum of upper lip
Lingual minor salivary gland
Deep lingual artery and veins and lingual nerve
Fimbriated fold
Submandibular duct
Sublingual gland
Frenulum of tongue
Sublingual fold with openings of sublingual ducts
Sublingual caruncle with opening of submandibular duct (of Wharton)
Frenulum of lower lip
Tubercle of upper lip
Papilla of parotid duct (of Stensen)

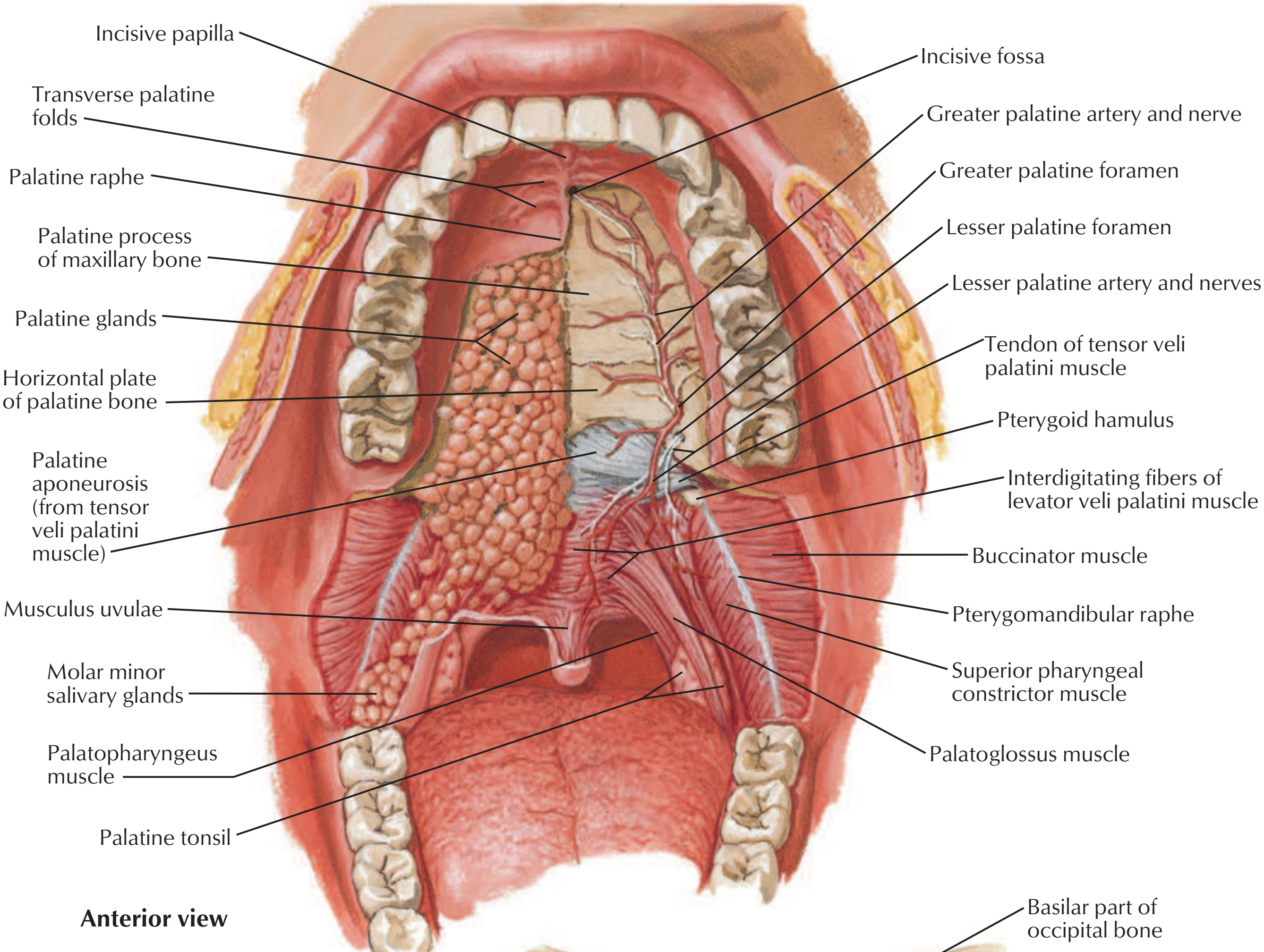
Afferent Innervation of Oral Cavity and Tongue

See also Plates 144, 146

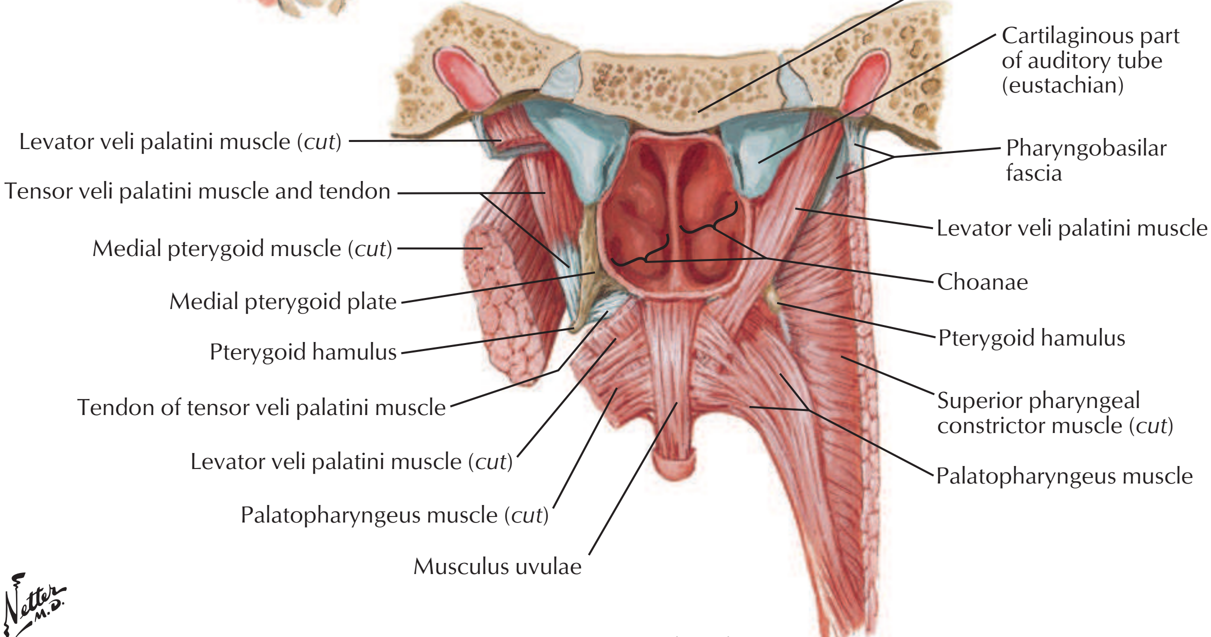

Midde superior alveolar branch
Anterior superior alveolar branch
Infraorbital nerve
Ophthalmic nerve (CN V$_1$)
Trigeminal nerve (CN V)
Trigeminal (semilunar) ganglion
Maxillary nerve (CN V$_2$)
Mandibular nerve (CN V$_3$)
Buccal nerve
Posterior superior alveolar branch
Lingual nerve
Inferior alveolar nerve
Mental nerve
Inferior alveolar nerve
Incisive branch
Anterior superior alveolar branch
Nasopalatine nerve
Infraorbital nerve
Middle superior alveolar nerve
Posterior superior alveolar branch and buccal nerves
Greater palatine nerve
Lesser palatine nerve
Middle superior alveolar branch
Posterior superior alveolar branch
Buccal nerve
Inferior alveolar nerve
Lingual nerve and nerve to mylohyoid muscle
Mental nerve (branch of inferior alveolar nerve)
Incisive branch
Glossopharyngeal nerve (CN IX)
Lingual nerve
Vagus nerve (CN X)
Taste and general sensation via superior laryngeal nerve
Glossopharyngeal nerve (CN IX)
Taste plus general sensation via lingual branches
Facial nerve (CN VII)
Intermediate nerve of (Wrisberg) via chorda tympani (taste)
Trigeminal nerve (CN V)
(mandibular nerve V$_3$) via lingual nerve (general sensation)
C.Machado M.D.

Roof of Oral Cavity

See also Plate 48

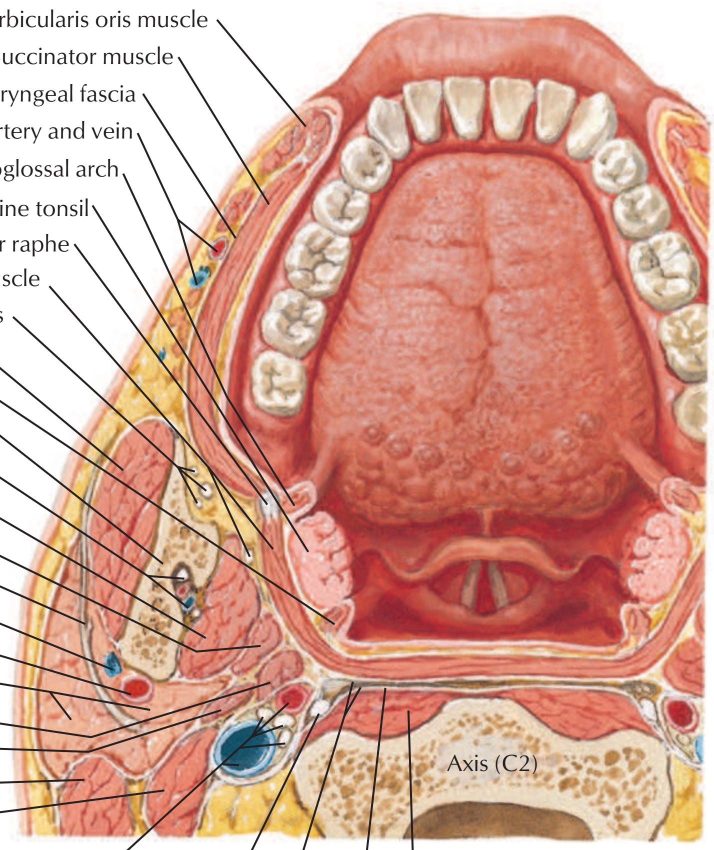

Incisive papilla
Transverse palatine folds
Palatine raphe
Palatine process of maxillary bone
Palatine glands
Horizontal plate of palatine bone
Palatine aponeurosis (from tensor veli palatini muscle)
Musculus uvulae
Molar minor salivary glands
Palatopharyngeus muscle
Palatine tonsil
Incisive fossa
Greater palatine artery and nerve
Greater palatine foramen
Lesser palatine foramen
Lesser palatine artery and nerves
Tendon of tensor veli palatini muscle
Pterygoid hamulus
Interdigitating fibers of levator veli palatini muscle
Buccinator muscle
Pterygomandibular raphe
Superior pharyngeal constrictor muscle
Palatoglossus muscle

Anterior view

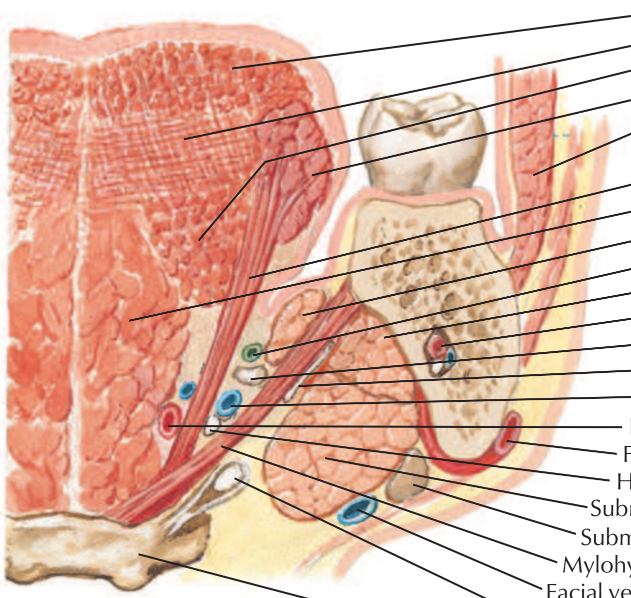

Basilar part of occipital bone
Cartilaginous part of auditory tube (eustachian)
Pharyngobasilar fascia
Levator veli palatini muscle (*cut*)
Tensor veli palatini muscle and tendon
Medial pterygoid muscle (*cut*)
Medial pterygoid plate
Pterygoid hamulus
Tendon of tensor veli palatini muscle
Levator veli palatini muscle (*cut*)
Palatopharyngeus muscle (*cut*)
Musculus uvulae
Levator veli palatini muscle
Choanae
Pterygoid hamulus
Superior pharyngeal constrictor muscle (*cut*)
Palatopharyngeus muscle

Posterior view

Horizontal section below lingula of mandible (superior view) demonstrating bed of parotid gland


Orbicularis oris muscle
Buccinator muscle
Buccopharyngeal fascia
Facial artery and vein
Palatoglossus muscle in palatoglossal arch
Palatine tonsil
Pterygomandibular raphe
Lingual nerve and superior pharyngeal constrictor muscle
Buccal nerve and branches
Masseter muscle
Palatopharyngeus muscle in palatopharyngeal arch
Ramus of mandible
Inferior alveolar artery, vein, and nerve to mylohyoid muscle
Medial pterygoid muscle
Styloglossus muscle
Facial nerve (CN VII)
Retromandibular vein
External carotid artery
Parotid gland
Stylopharyngeus muscle
Stylohyoid muscle
Sternocleidomastoid muscle
Digastric muscle (posterior belly)
Internal jugular vein, internal carotid artery, and nerves CN IX, CN X, and CN XII in carotid sheath
Superior cervical sympathetic ganglion
Buccopharyngeal fascia and retropharyngeal space
Prevertebral fascia
Longus capitis muscle
Axis (C2)

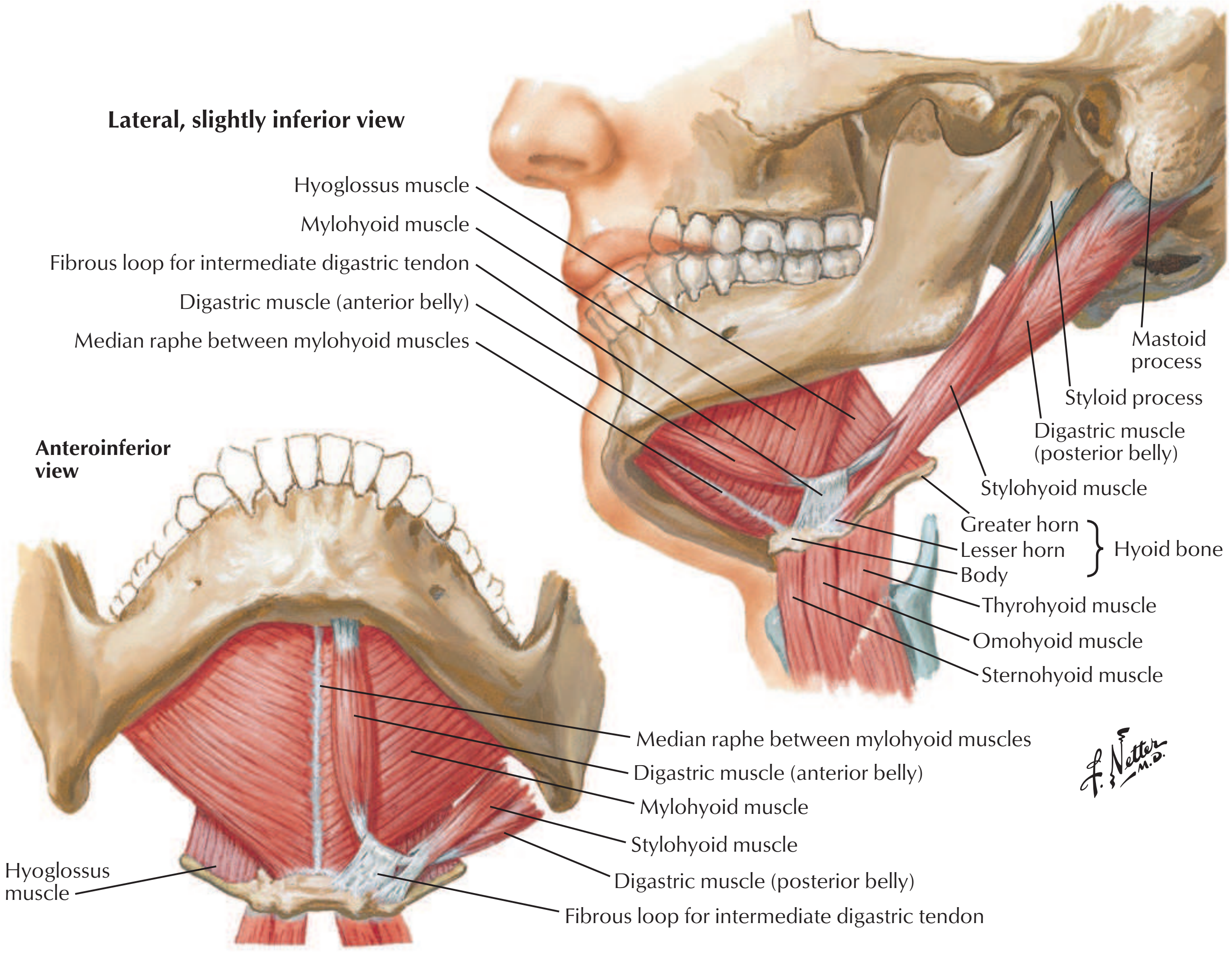
F. Netter M.D.


Superior longitudinal lingual muscle
Verticalis and transversus linguae muscles
Inferior longitudinal lingual muscle
of tongue
Styloglossus muscle
Buccinator muscle
Hyoglossus muscle
Genioglossus muscle
Sublingual salivary gland
Submandibular duct
Submandibular salivary gland
Mandibular canal, inferior alveolar artery, vein, and nerve
Lingual nerve
Nerve to mylohyoid muscle
Vena comitans of hypoglossal nerve (to lingual vein)
Lingual artery
Facial artery
Hypoglossal nerve (CN XII)
Submandibular salivary gland
Submandibular lymph node
Mylohyoid muscle
Facial vein
Intermediate digastric tendon
Hyoid bone

Coronal section posterior to 1st molar tooth (anterior view) demonstrating sublingual and submandibular glands

Floor of Oral Cavity

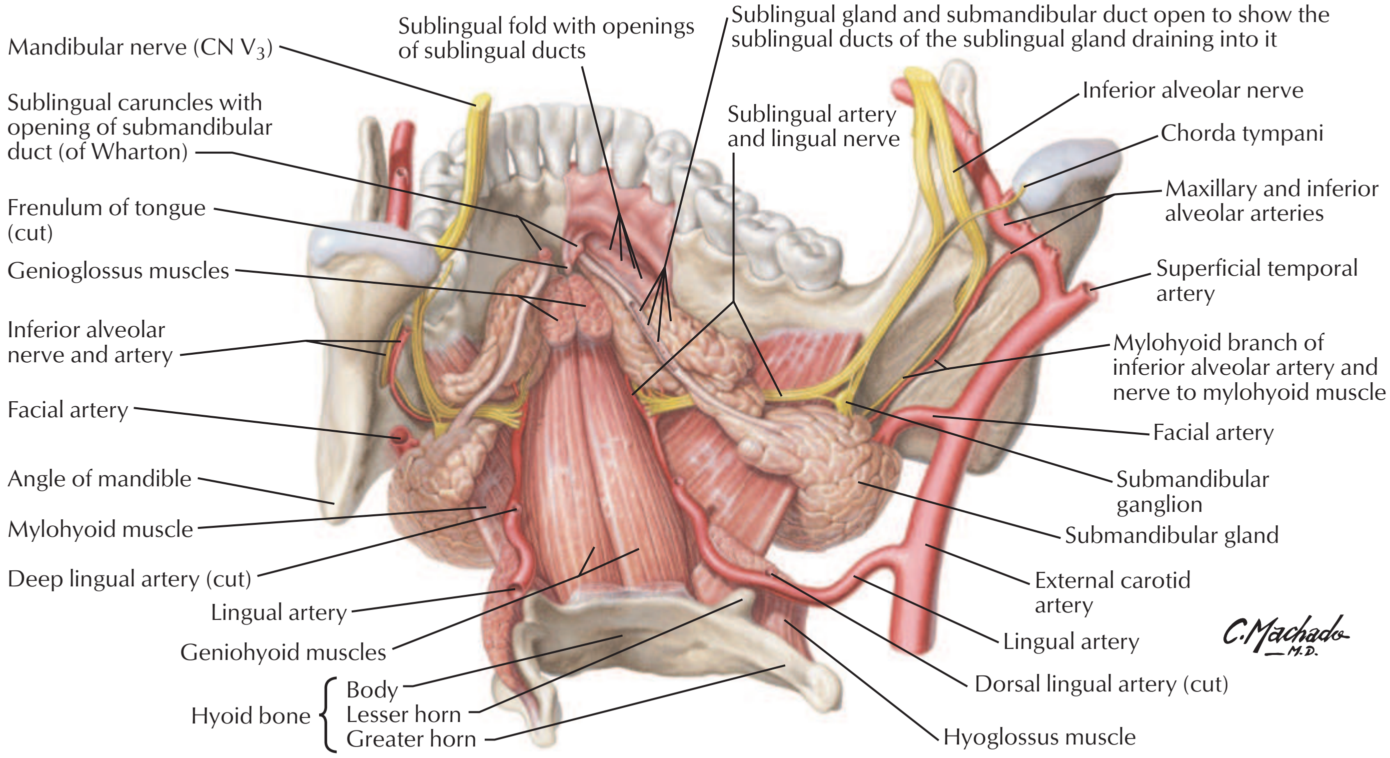
See also Plate 35



Lateral, slightly inferior view

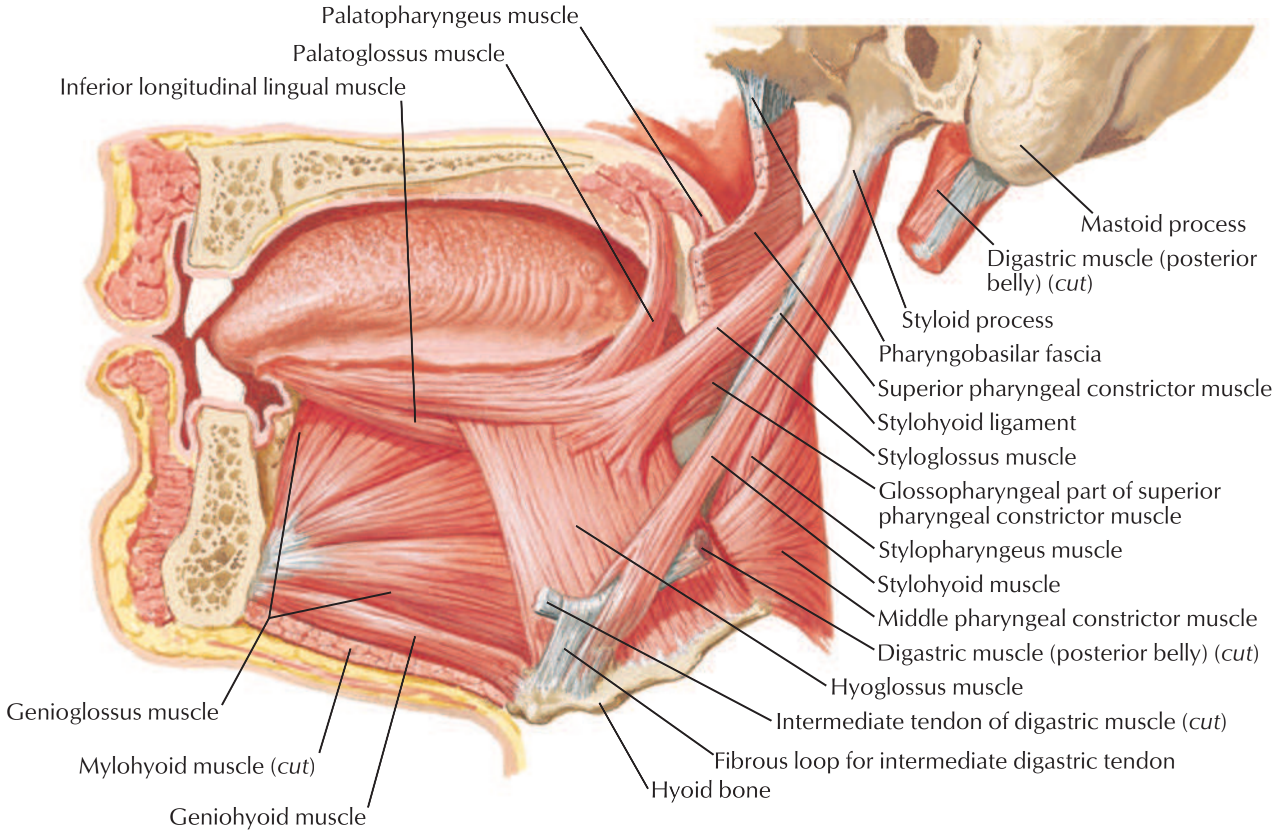
Anteroinferior view

Hyoglossus muscle
Mylohyoid muscle
Fibrous loop for intermediate digastric tendon
Digastric muscle (anterior belly)
Median raphe between mylohyoid muscles
Mastoid process
Styloid process
Digastric muscle (posterior belly)
Stylohyoid muscle
Greater horn
Lesser horn
Body
Hyoid bone
Thyrohyoid muscle
Omohyoid muscle
Sternohyoid muscle
Median raphe between mylohyoid muscles
Digastric muscle (anterior belly)
Mylohyoid muscle
Stylohyoid muscle
Digastric muscle (posterior belly)
Fibrous loop for intermediate digastric tendon
Hyoglossus muscle

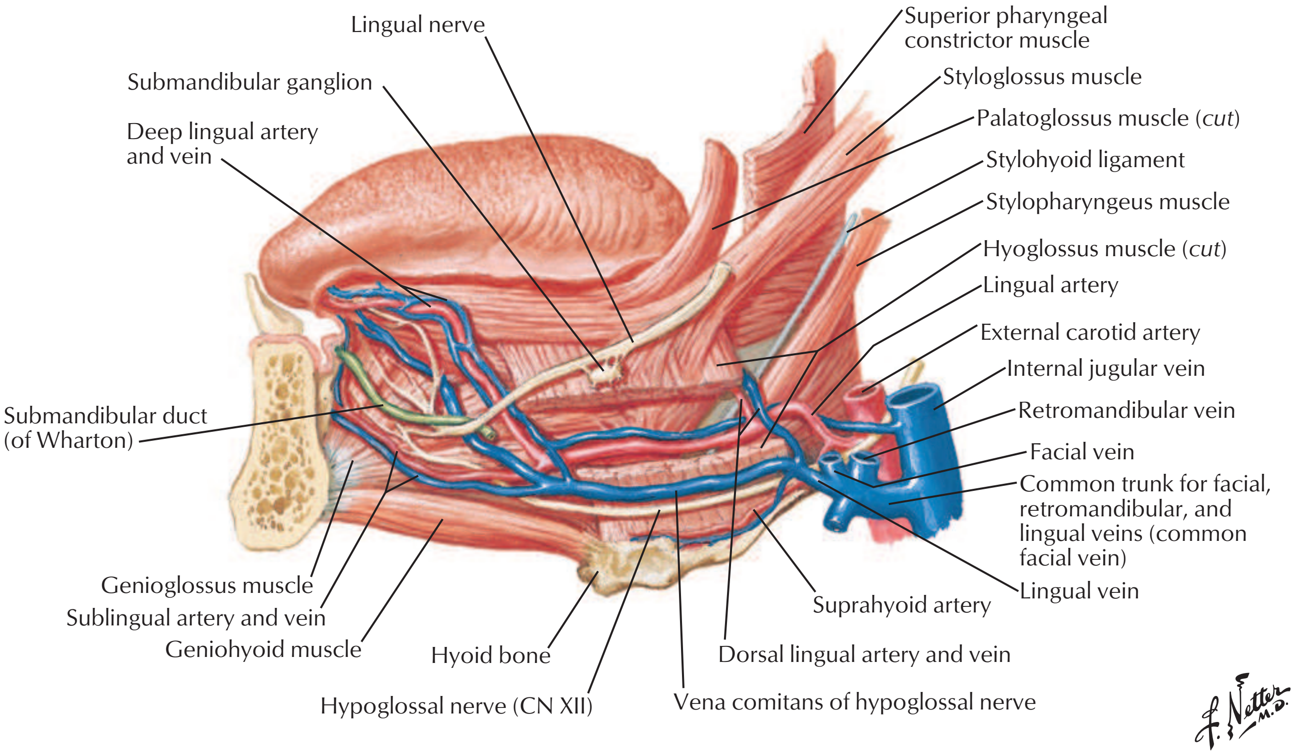


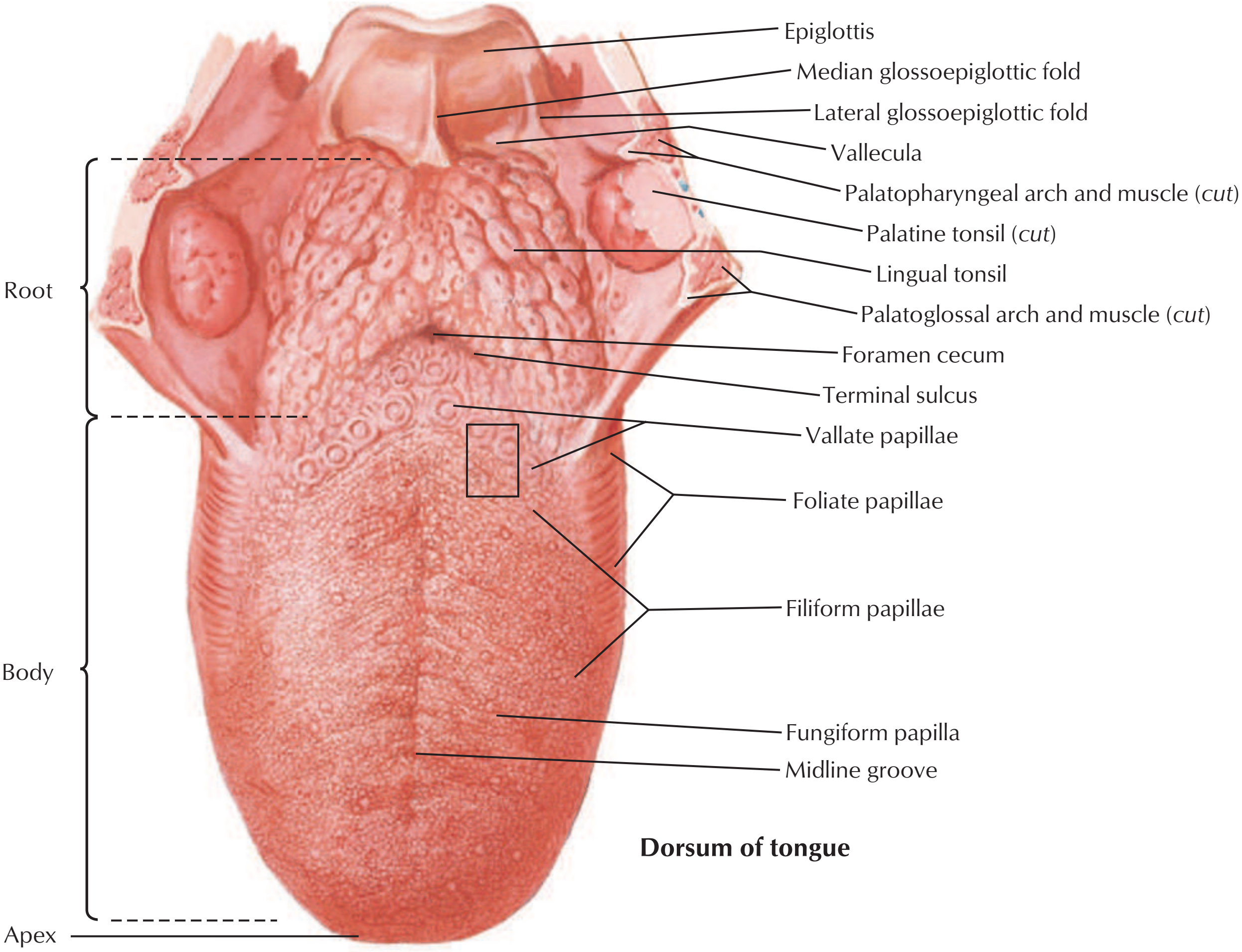
Sublingual gland and submandibular duct open to show the sublingual ducts of the sublingual gland draining into it
Mandibular nerve (CN V_3)
Sublingual fold with openings of sublingual ducts
Sublingual caruncles with opening of submandibular duct (of Wharton)
Sublingual artery and lingual nerve
Inferior alveolar nerve
Chorda tympani
Maxillary and inferior alveolar arteries
Frenulum of tongue (cut)
Genioglossus muscles
Superficial temporal artery
Inferior alveolar nerve and artery
Mylohyoid branch of inferior alveolar artery and nerve to mylohyoid muscle
Facial artery
Facial artery
Angle of mandible
Submandibular ganglion
Mylohyoid muscle
Submandibular gland
Deep lingual artery (cut)
External carotid artery
Lingual artery
Lingual artery
Geniohyoid muscles
Dorsal lingual artery (cut)
Hyoid bone
Body
Lesser horn
Greater horn
Hyoglossus muscle

See also Plates 69, 139

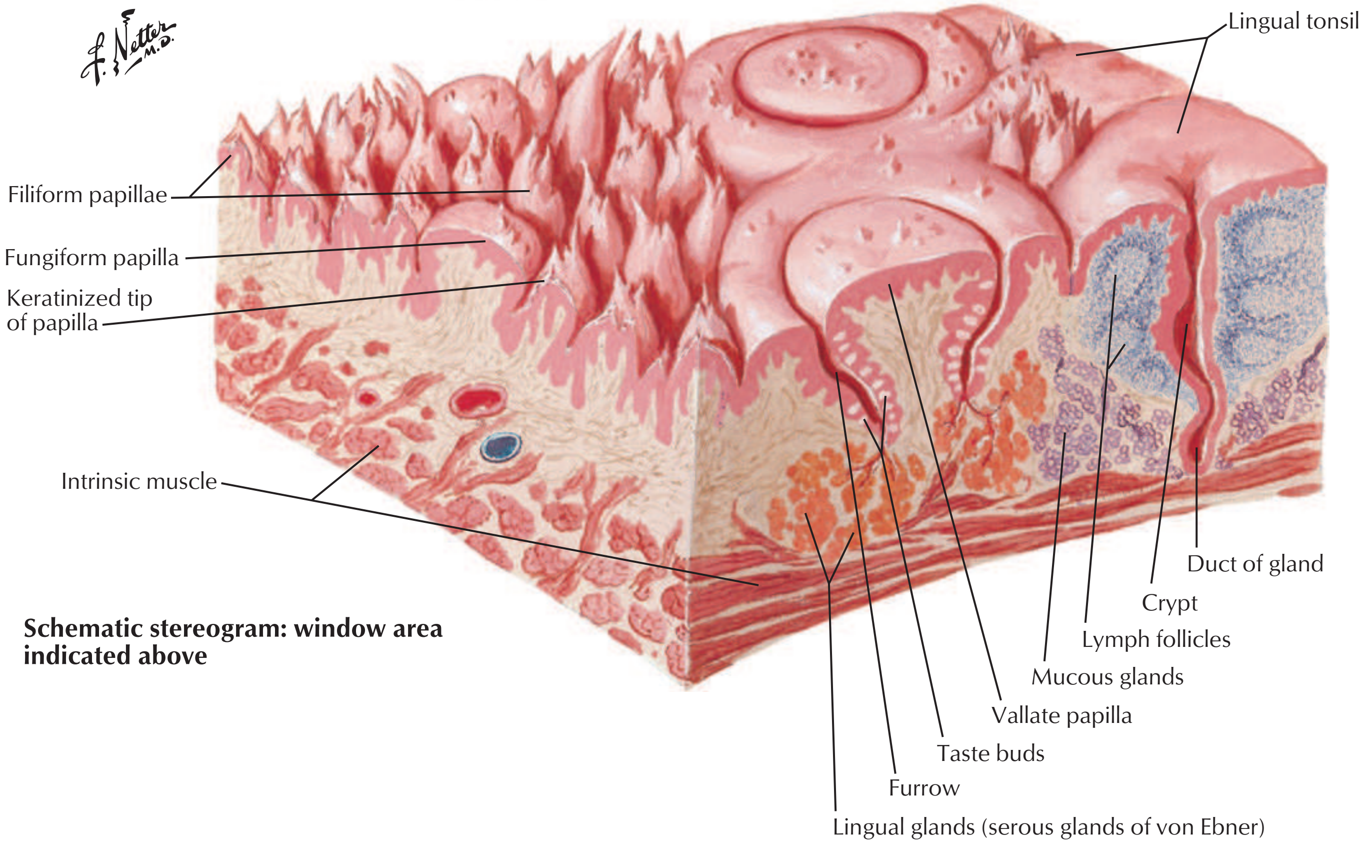

Palatopharyngeus muscle
Palatoglossus muscle
Inferior longitudinal lingual muscle
Mastoid process
Digastric muscle (posterior belly) (*cut*)
Styloid process
Pharyngobasilar fascia
Superior pharyngeal constrictor muscle
Stylohyoid ligament
Styloglossus muscle
Glossopharyngeal part of superior pharyngeal constrictor muscle
Stylopharyngeus muscle
Stylohyoid muscle
Middle pharyngeal constrictor muscle
Digastric muscle (posterior belly) (*cut*)
Hyoglossus muscle
Intermediate tendon of digastric muscle (*cut*)
Fibrous loop for intermediate digastric tendon
Hyoid bone
Genioglossus muscle
Mylohyoid muscle (*cut*)
Geniohyoid muscle

Lateral view (left side of mandible removed)


Lingual nerve
Submandibular ganglion
Deep lingual artery and vein
Superior pharyngeal constrictor muscle
Styloglossus muscle
Palatoglossus muscle (*cut*)
Stylohyoid ligament
Stylopharyngeus muscle
Hyoglossus muscle (*cut*)
Lingual artery
External carotid artery
Internal jugular vein
Retromandibular vein
Facial vein
Common trunk for facial, retromandibular, and lingual veins (common facial vein)
Lingual vein
Submandibular duct (of Wharton)
Genioglossus muscle
Sublingual artery and vein
Geniohyoid muscle
Hyoid bone
Hypoglossal nerve (CN XII)
Vena comitans of hypoglossal nerve
Dorsal lingual artery and vein
Suprahyoid artery
F. Netter M.D.

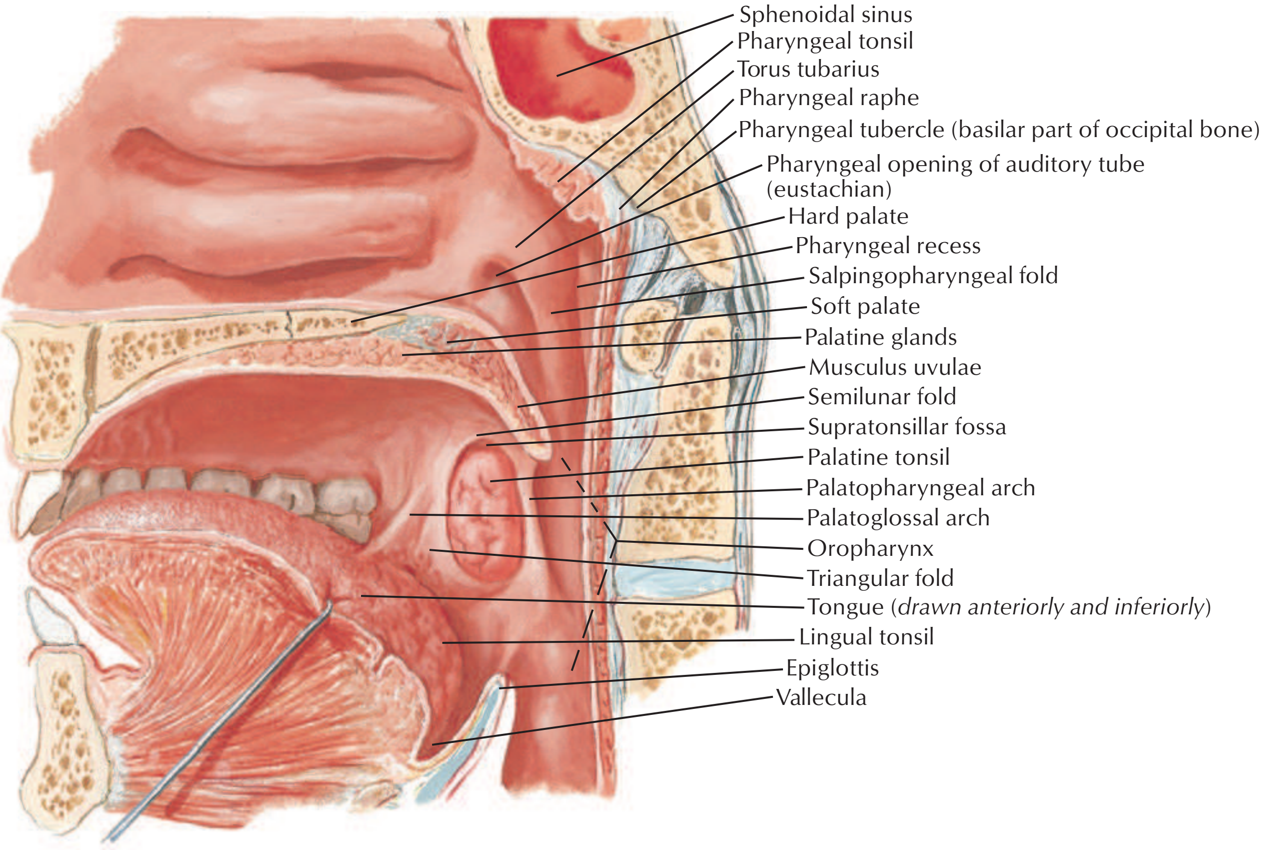

Epiglottis
Median glossoepiglottic fold
Lateral glossoepiglottic fold
Vallecula
Palatopharyngeal arch and muscle (*cut*)
Palatine tonsil (*cut*)
Lingual tonsil
Palatoglossal arch and muscle (*cut*)
Foramen cecum
Terminal sulcus
Vallate papillae
Foliate papillae
Filiform papillae
Fungiform papilla
Midline groove
Root
Body
Apex

Dorsum of tongue

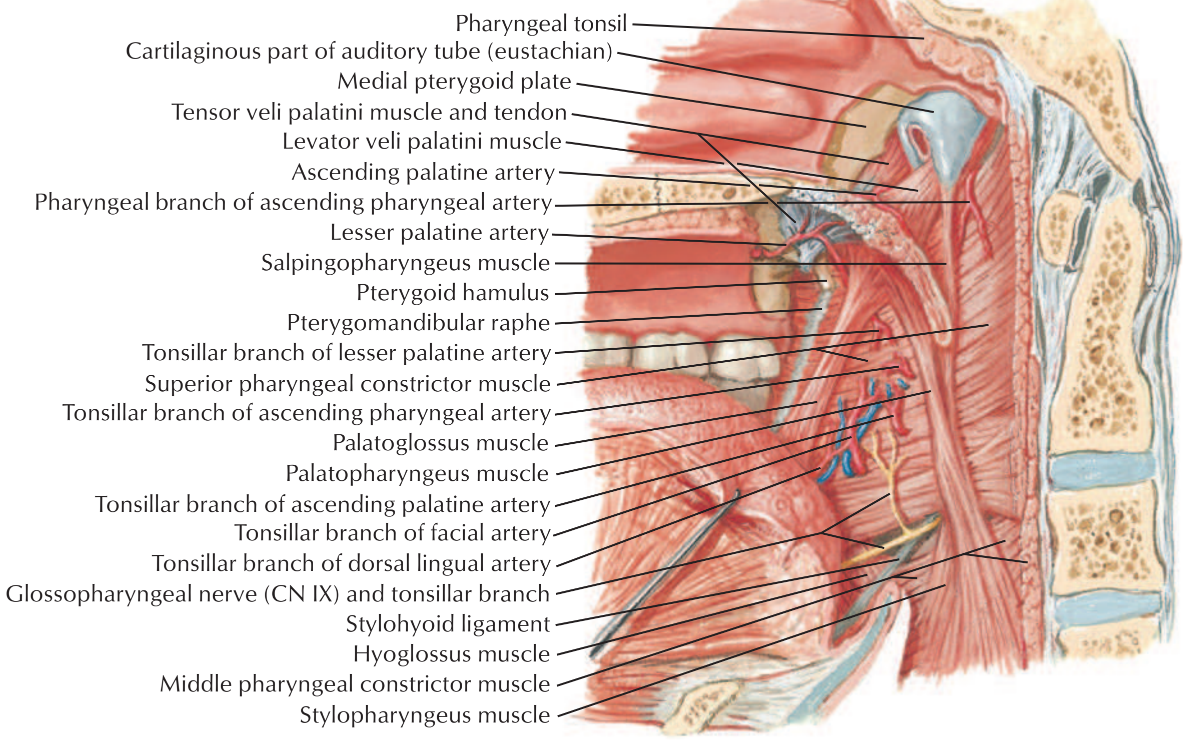

Lingual tonsil
Filiform papillae
Fungiform papilla
Keratinized tip of papilla
Intrinsic muscle
Duct of gland
Crypt
Lymph follicles
Mucous glands
Vallate papilla
Taste buds
Furrow
Lingual glands (serous glands of von Ebner)

Schematic stereogram: window area indicated above

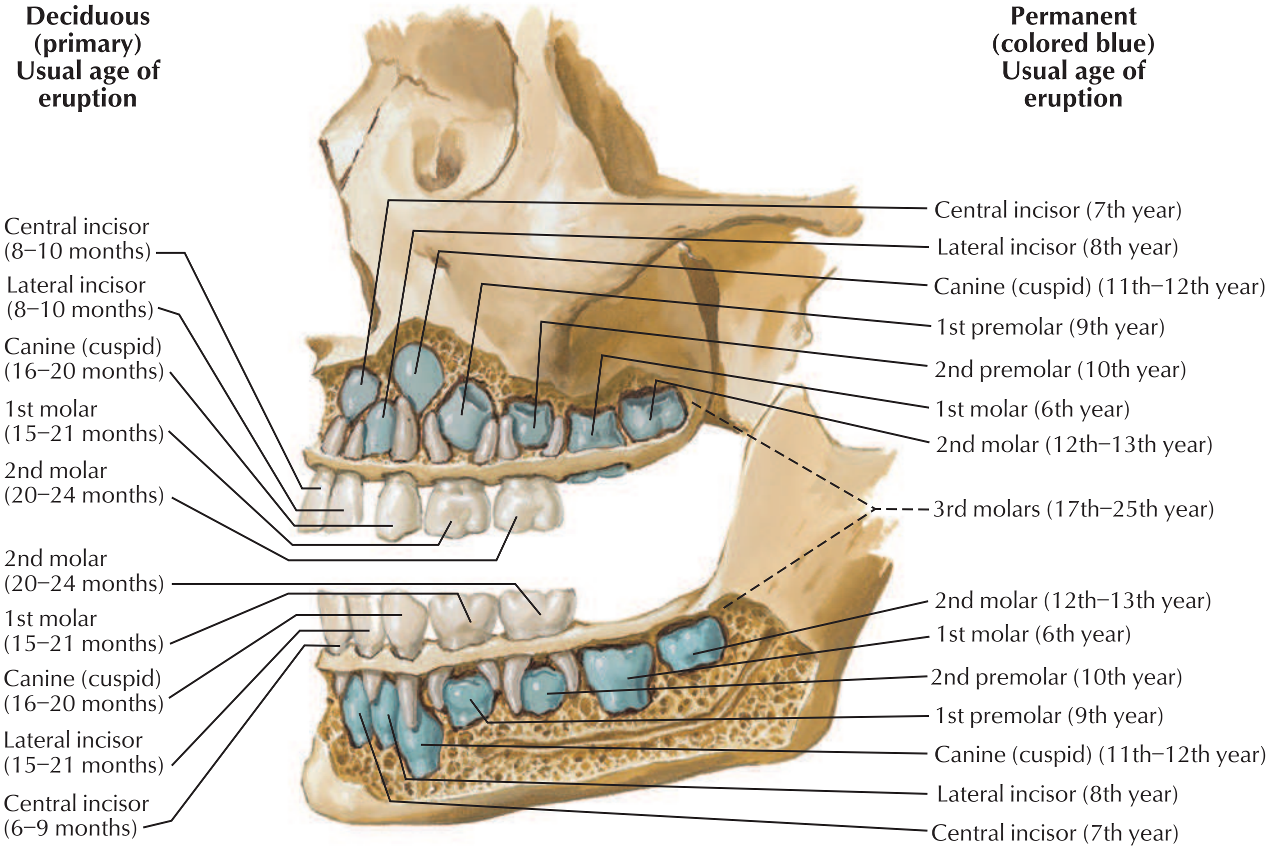
Medial view sagittal section

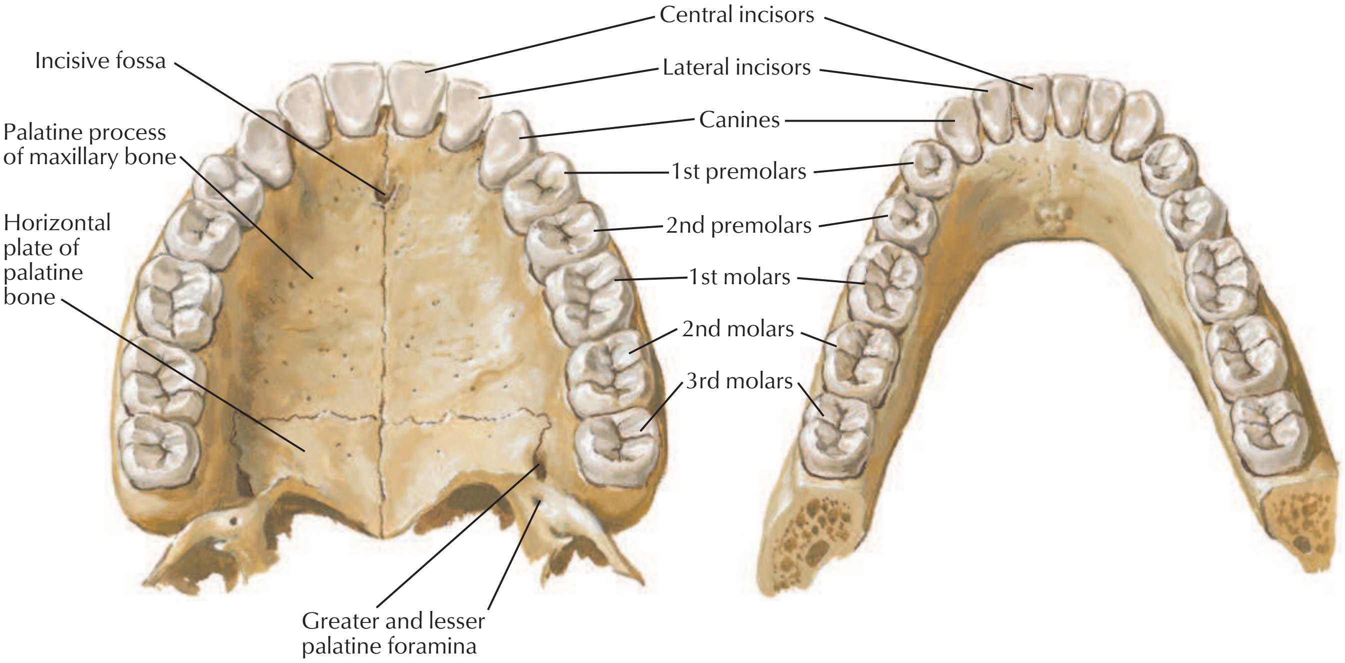

Sphenoidal sinus
Pharyngeal tonsil
Torus tubarius
Pharyngeal raphe
Pharyngeal tubercle (basilar part of occipital bone)
Pharyngeal opening of auditory tube (eustachian)
Hard palate
Pharyngeal recess
Salpingopharyngeal fold
Soft palate
Palatine glands
Musculus uvulae
Semilunar fold
Supratonsillar fossa
Palatine tonsil
Palatopharyngeal arch
Palatoglossal arch
Oropharynx
Triangular fold
Tongue (*drawn anteriorly and inferiorly*)
Lingual tonsil
Epiglottis
Vallecula

Pharyngeal mucosa removed


Pharyngeal tonsil
Cartilaginous part of auditory tube (eustachian)
Medial pterygoid plate
Tensor veli palatini muscle and tendon
Levator veli palatini muscle
Ascending palatine artery
Pharyngeal branch of ascending pharyngeal artery
Lesser palatine artery
Salpingopharyngeus muscle
Pterygoid hamulus
Pterygomandibular raphe
Tonsillar branch of lesser palatine artery
Superior pharyngeal constrictor muscle
Tonsillar branch of ascending pharyngeal artery
Palatoglossus muscle
Palatopharyngeus muscle
Tonsillar branch of ascending palatine artery
Tonsillar branch of facial artery
Tonsillar branch of dorsal lingual artery
Glossopharyngeal nerve (CN IX) and tonsillar branch
Stylohyoid ligament
Hyoglossus muscle
Middle pharyngeal constrictor muscle
Stylopharyngeus muscle

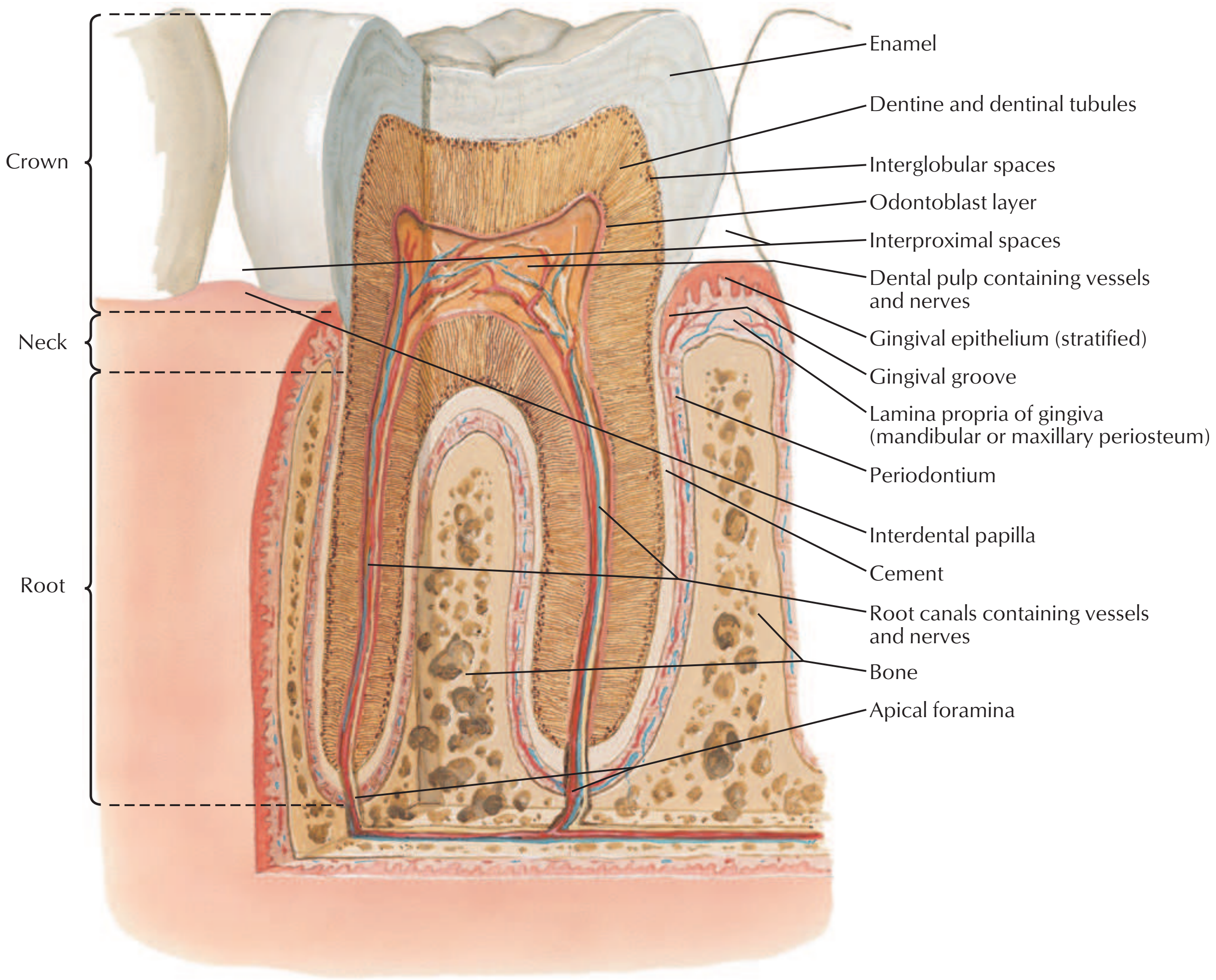
See also Plate 67

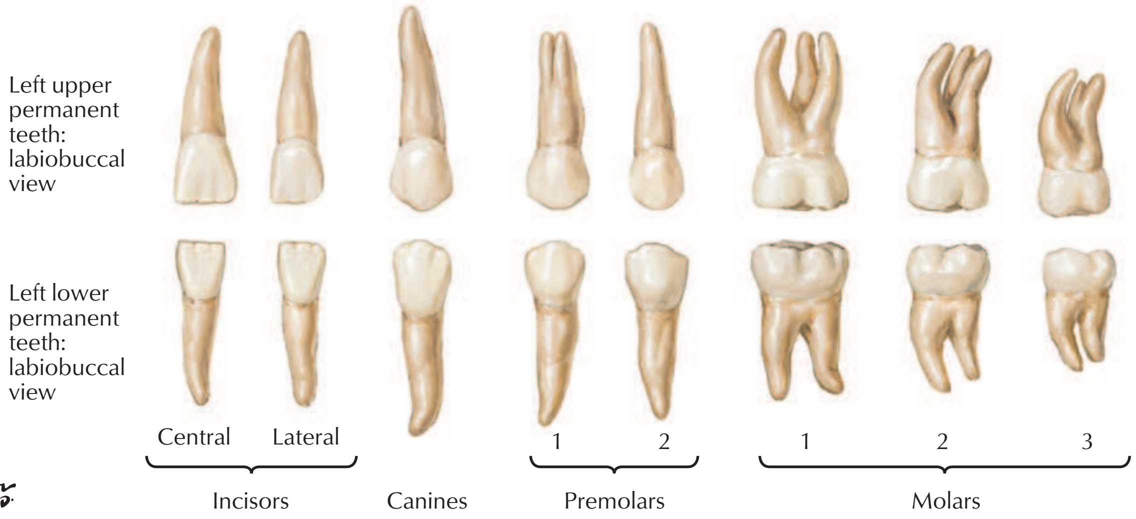

Deciduous (primary) Usual age of eruption
Permanent (colored blue) Usual age of eruption
Central incisor (8–10 months)
Lateral incisor (8–10 months)
Canine (cuspid) (16–20 months)
1st molar (15–21 months)
2nd molar (20–24 months)
2nd molar (20–24 months)
1st molar (15–21 months)
Canine (cuspid) (16–20 months)
Lateral incisor (15–21 months)
Central incisor (6–9 months)
Central incisor (7th year)
Lateral incisor (8th year)
Canine (cuspid) (11th–12th year)
1st premolar (9th year)
2nd premolar (10th year)
1st molar (6th year)
2nd molar (12th–13th year)
3rd molars (17th–25th year)
2nd molar (12th–13th year)
1st molar (6th year)
2nd premolar (10th year)
1st premolar (9th year)
Canine (cuspid) (11th–12th year)
Lateral incisor (8th year)
Central incisor (7th year)


Central incisors
Lateral incisors
Canines
1st premolars
2nd premolars
1st molars
2nd molars
3rd molars
Incisive fossa
Palatine process of maxillary bone
Horizontal plate of palatine bone
Greater and lesser palatine foramina

Upper permanent teeth

Lower permanent teeth

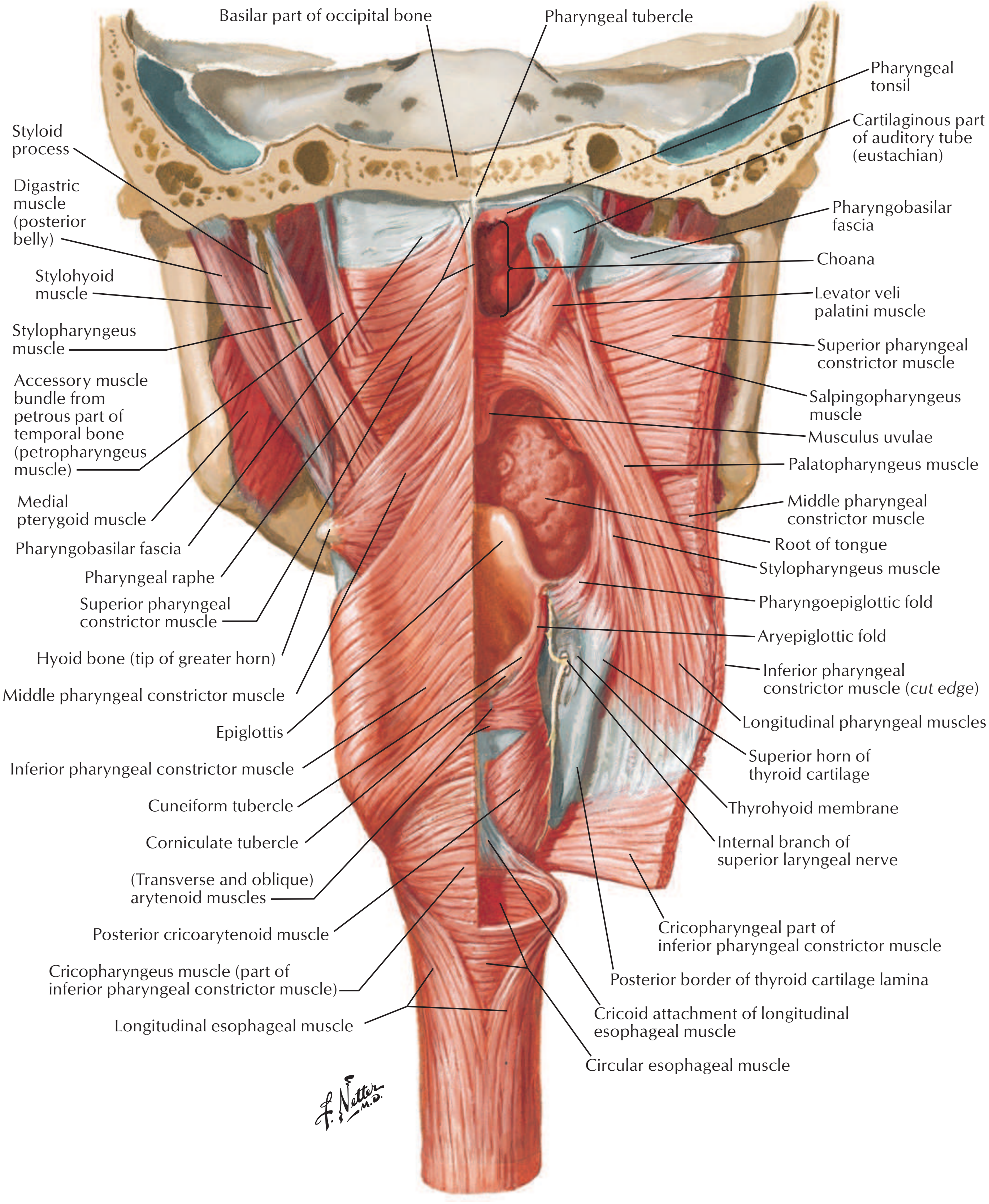

Crown
Neck
Root
Enamel
Dentine and dentinal tubules
Interglobular spaces
Odontoblast layer
Interproximal spaces
Dental pulp containing vessels and nerves
Gingival epithelium (stratified)
Gingival groove
Lamina propria of gingiva (mandibular or maxillary periosteum)
Periodontium
Interdental papilla
Cement
Root canals containing vessels and nerves
Bone
Apical foramina


Left upper permanent teeth: labiobuccal view
Left lower permanent teeth: labiobuccal view
Central
Lateral
Incisors
Canines
1
2
Premolars
1
2
3
Molars

F. Netter M.D.

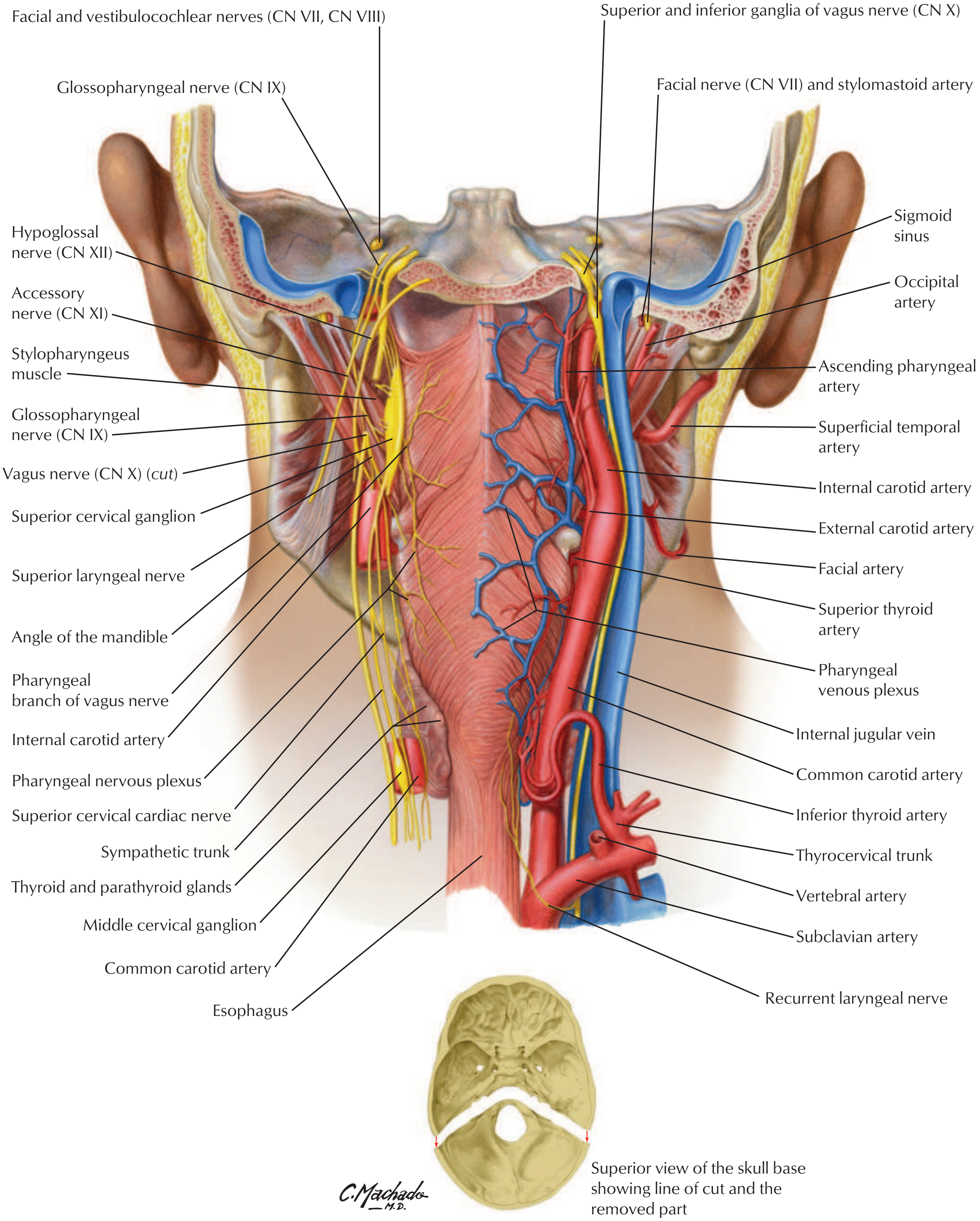
Muscles of Pharynx: Partially Opened Posterior View

See also **Plates 76, 81**


Basilar part of occipital bone
Pharyngeal tubercle
Pharyngeal tonsil
Cartilaginous part of auditory tube (eustachian)
Pharyngobasilar fascia
Choana
Levator veli palatini muscle
Superior pharyngeal constrictor muscle
Salpingopharyngeus muscle
Musculus uvulae
Palatopharyngeus muscle
Middle pharyngeal constrictor muscle
Root of tongue
Stylopharyngeus muscle
Pharyngoepiglottic fold
Aryepiglottic fold
Inferior pharyngeal constrictor muscle (*cut edge*)
Longitudinal pharyngeal muscles
Superior horn of thyroid cartilage
Thyrohyoid membrane
Internal branch of superior laryngeal nerve
Cricopharyngeal part of inferior pharyngeal constrictor muscle
Posterior border of thyroid cartilage lamina
Cricoid attachment of longitudinal esophageal muscle
Circular esophageal muscle
Styloid process
Digastric muscle (posterior belly)
Stylohyoid muscle
Stylopharyngeus muscle
Accessory muscle bundle from petrous part of temporal bone (petropharyngeus muscle)
Medial pterygoid muscle
Pharyngobasilar fascia
Pharyngeal raphe
Superior pharyngeal constrictor muscle
Hyoid bone (tip of greater horn)
Middle pharyngeal constrictor muscle
Epiglottis
Inferior pharyngeal constrictor muscle
Cuneiform tubercle
Corniculate tubercle
(Transverse and oblique) arytenoid muscles
Posterior cricoarytenoid muscle
Cricopharyngeus muscle (part of inferior pharyngeal constrictor muscle)
Longitudinal esophageal muscle
F. Netter M.D.

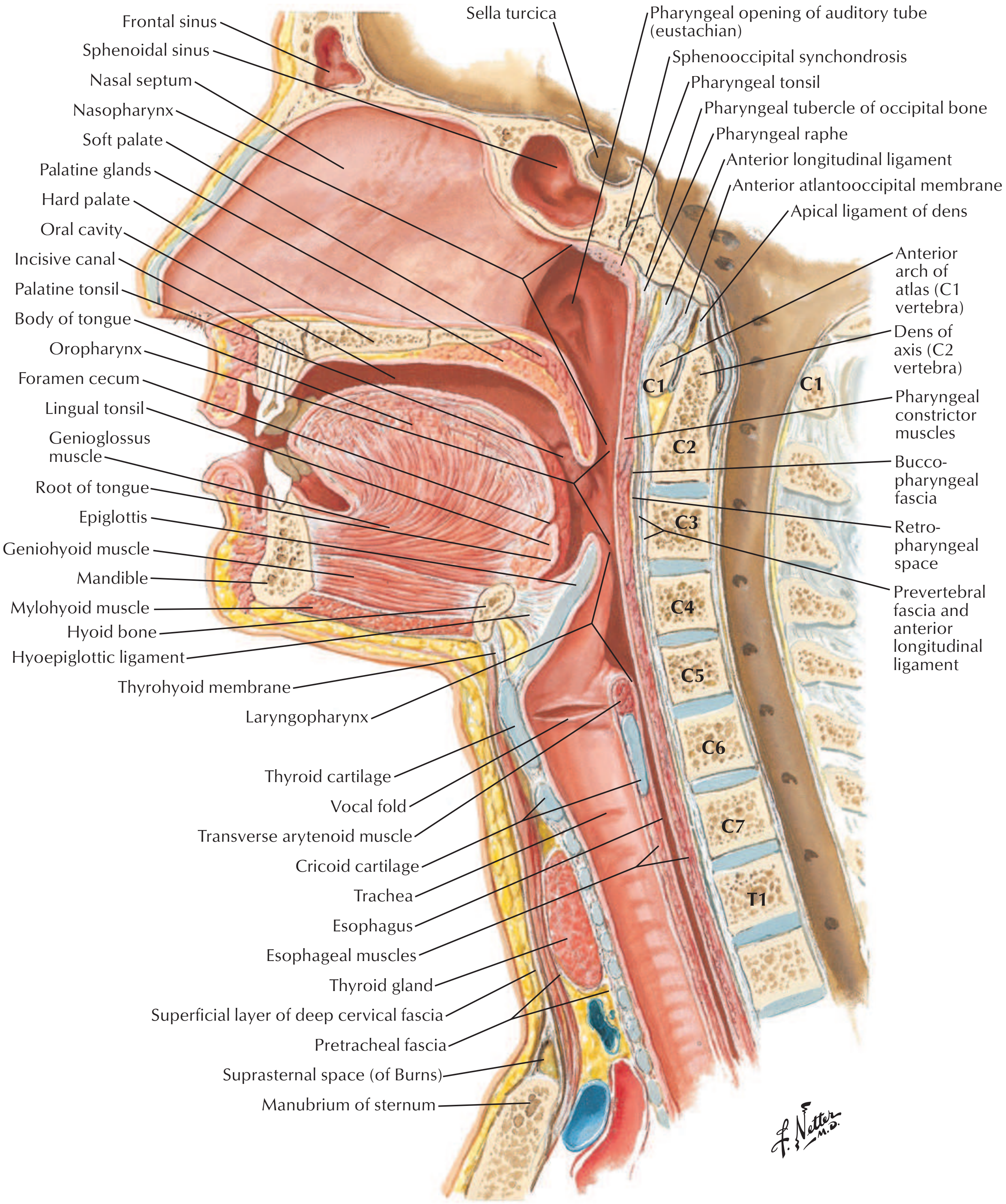
Posterior View of Pharynx: Nerves and Vessels

See also Plates 75, 79, 82, 83

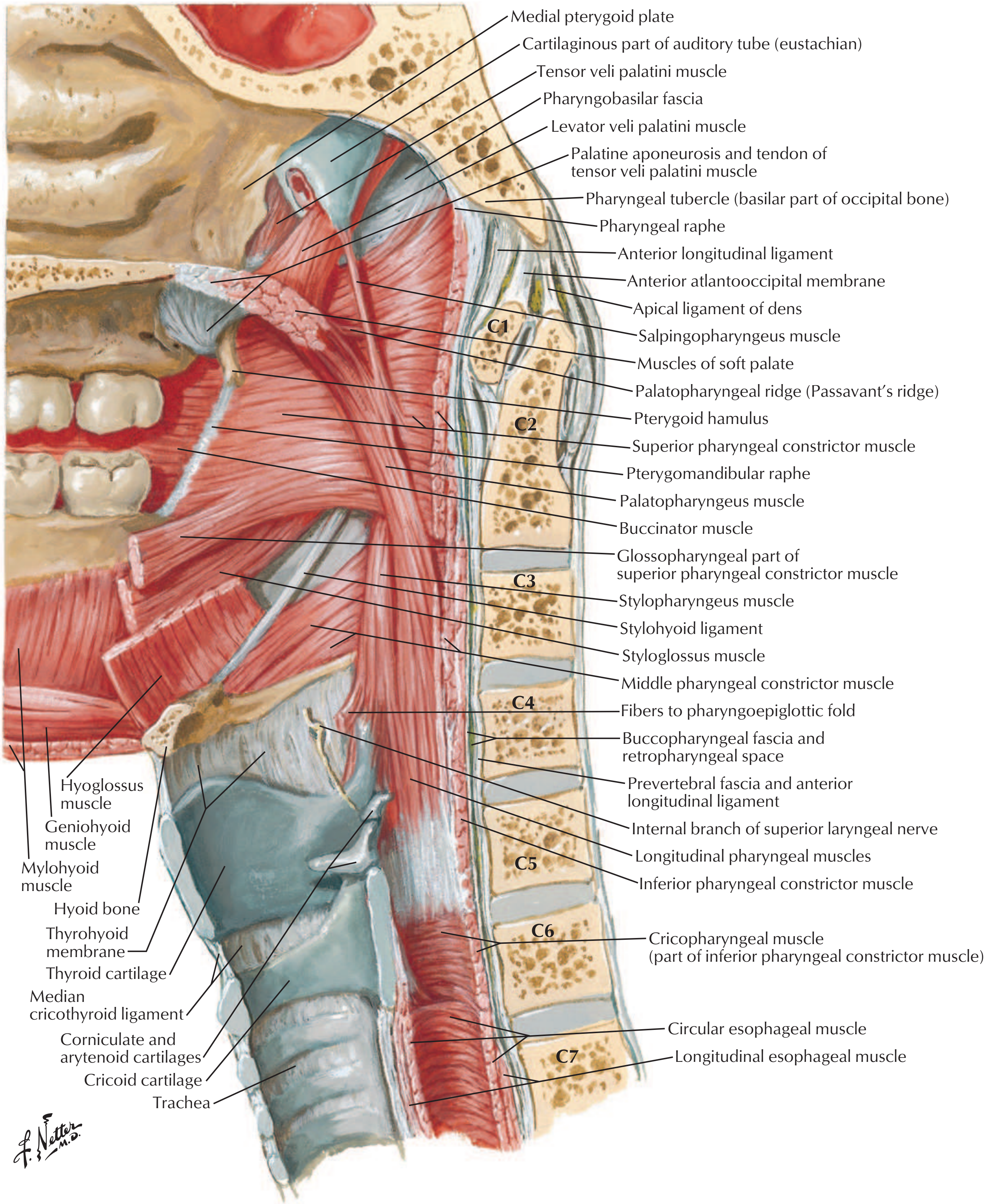

Facial and vestibulocochlear nerves (CN VII, CN VIII)
Glossopharyngeal nerve (CN IX)
Hypoglossal nerve (CN XII)
Accessory nerve (CN XI)
Stylopharyngeus muscle
Glossopharyngeal nerve (CN IX)
Vagus nerve (CN X) (*cut*)
Superior cervical ganglion
Superior laryngeal nerve
Angle of the mandible
Pharyngeal branch of vagus nerve
Internal carotid artery
Pharyngeal nervous plexus
Superior cervical cardiac nerve
Sympathetic trunk
Thyroid and parathyroid glands
Middle cervical ganglion
Common carotid artery
Esophagus
Superior and inferior ganglia of vagus nerve (CN X)
Facial nerve (CN VII) and stylomastoid artery
Sigmoid sinus
Occipital artery
Ascending pharyngeal artery
Superficial temporal artery
Internal carotid artery
External carotid artery
Facial artery
Superior thyroid artery
Pharyngeal venous plexus
Internal jugular vein
Common carotid artery
Inferior thyroid artery
Thyrocervical trunk
Vertebral artery
Subclavian artery
Recurrent laryngeal nerve

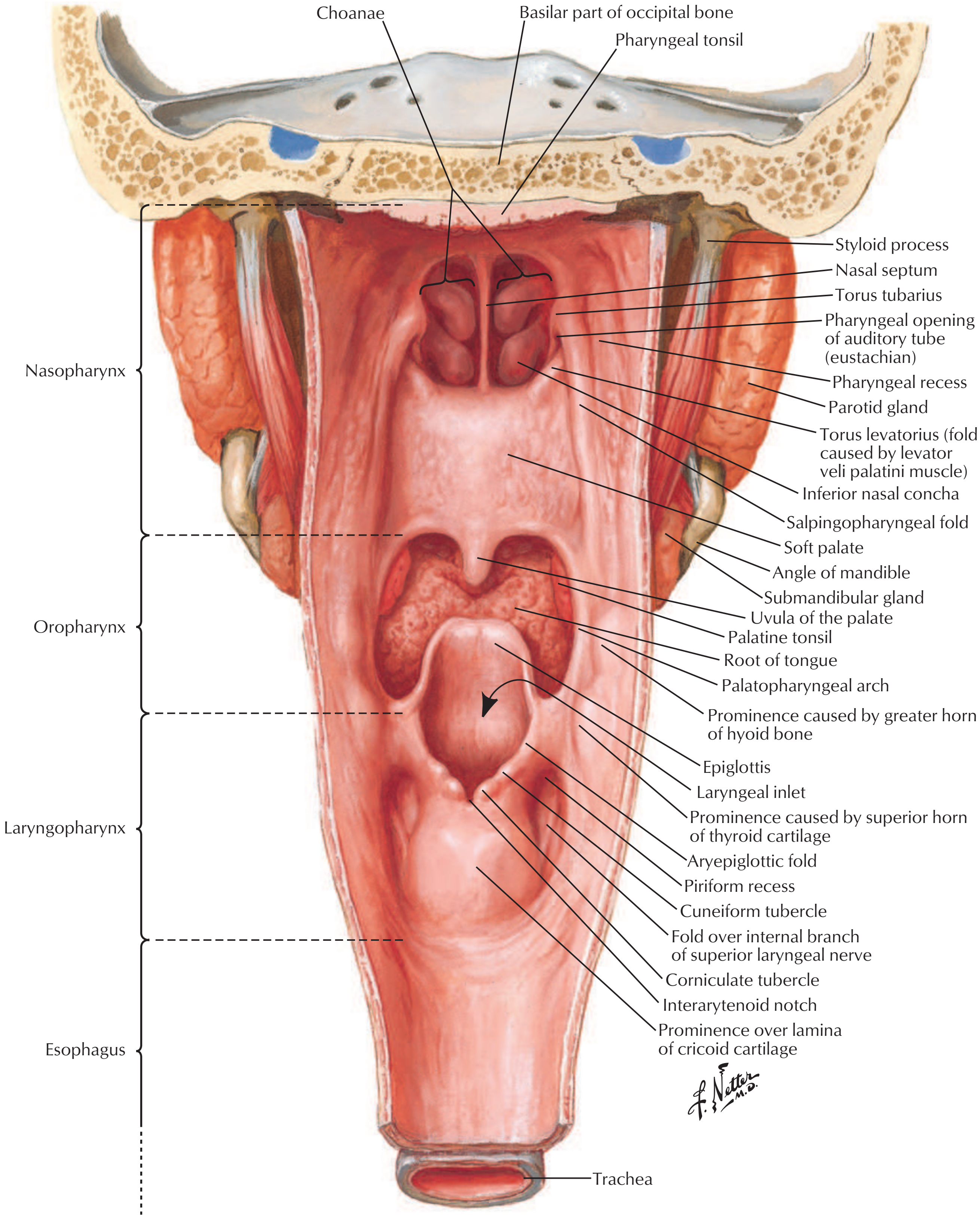
Superior view of the skull base showing line of cut and the removed part

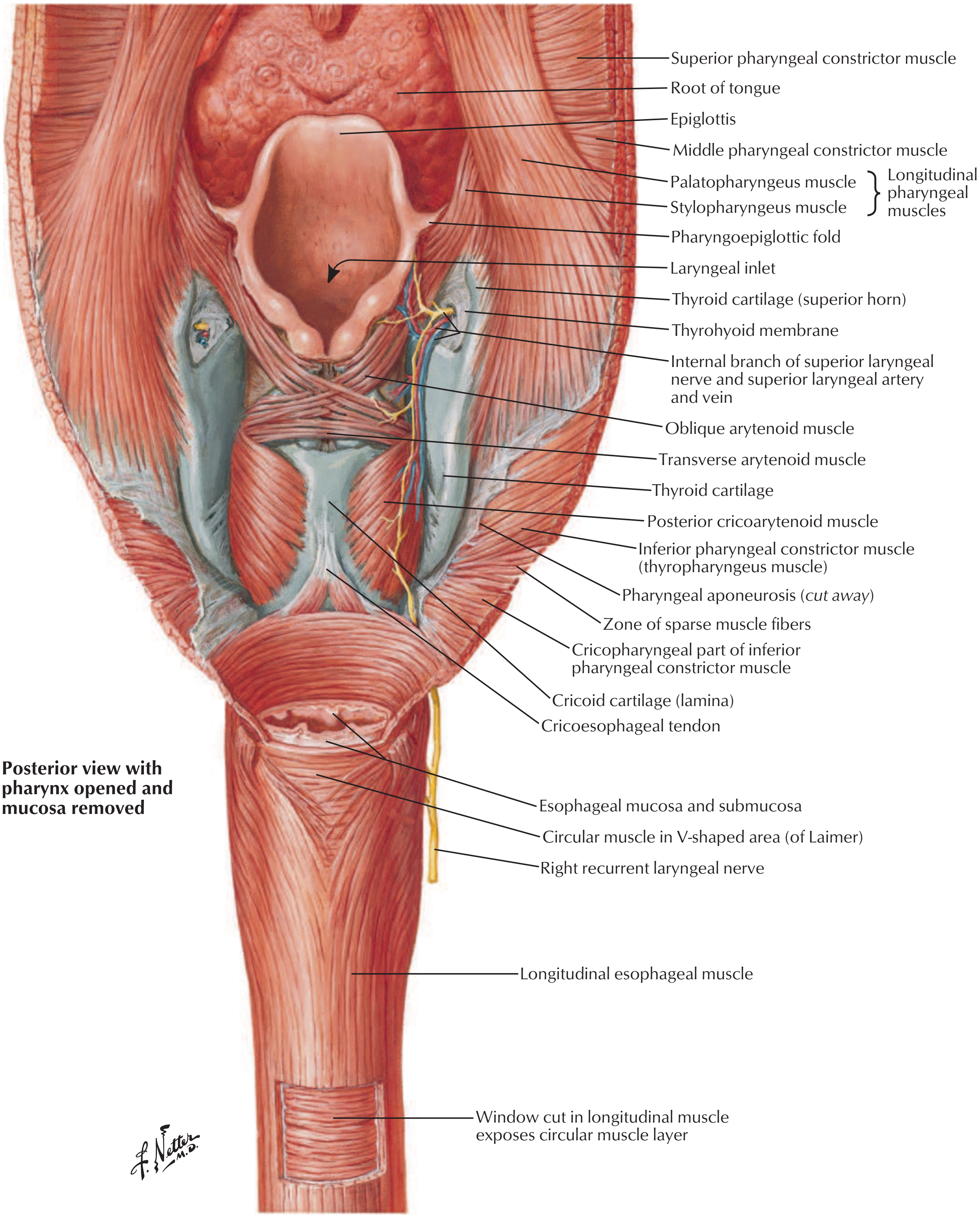
Pharynx: Medial View


Frontal sinus
Sphenoidal sinus
Nasal septum
Nasopharynx
Soft palate
Palatine glands
Hard palate
Oral cavity
Incisive canal
Palatine tonsil
Body of tongue
Oropharynx
Foramen cecum
Lingual tonsil
Genioglossus muscle
Root of tongue
Epiglottis
Geniohyoid muscle
Mandible
Mylohyoid muscle
Hyoid bone
Hyoepiglottic ligament
Thyrohyoid membrane
Laryngopharynx
Thyroid cartilage
Vocal fold
Transverse arytenoid muscle
Cricoid cartilage
Trachea
Esophagus
Esophageal muscles
Thyroid gland
Superficial layer of deep cervical fascia
Pretracheal fascia
Suprasternal space (of Burns)
Manubrium of sternum
Sella turcica
Pharyngeal opening of auditory tube (eustachian)
Sphenooccipital synchondrosis
Pharyngeal tonsil
Pharyngeal tubercle of occipital bone
Pharyngeal raphe
Anterior longitudinal ligament
Anterior atlantooccipital membrane
Apical ligament of dens
Anterior arch of atlas (C1 vertebra)
Dens of axis (C2 vertebra)
Pharyngeal constrictor muscles
Bucco-pharyngeal fascia
Retro-pharyngeal space
Prevertebral fascia and anterior longitudinal ligament
C1
C1
C2
C3
C4
C5
C6
C7
T1
F. Netter M.D.

See also Plate 72

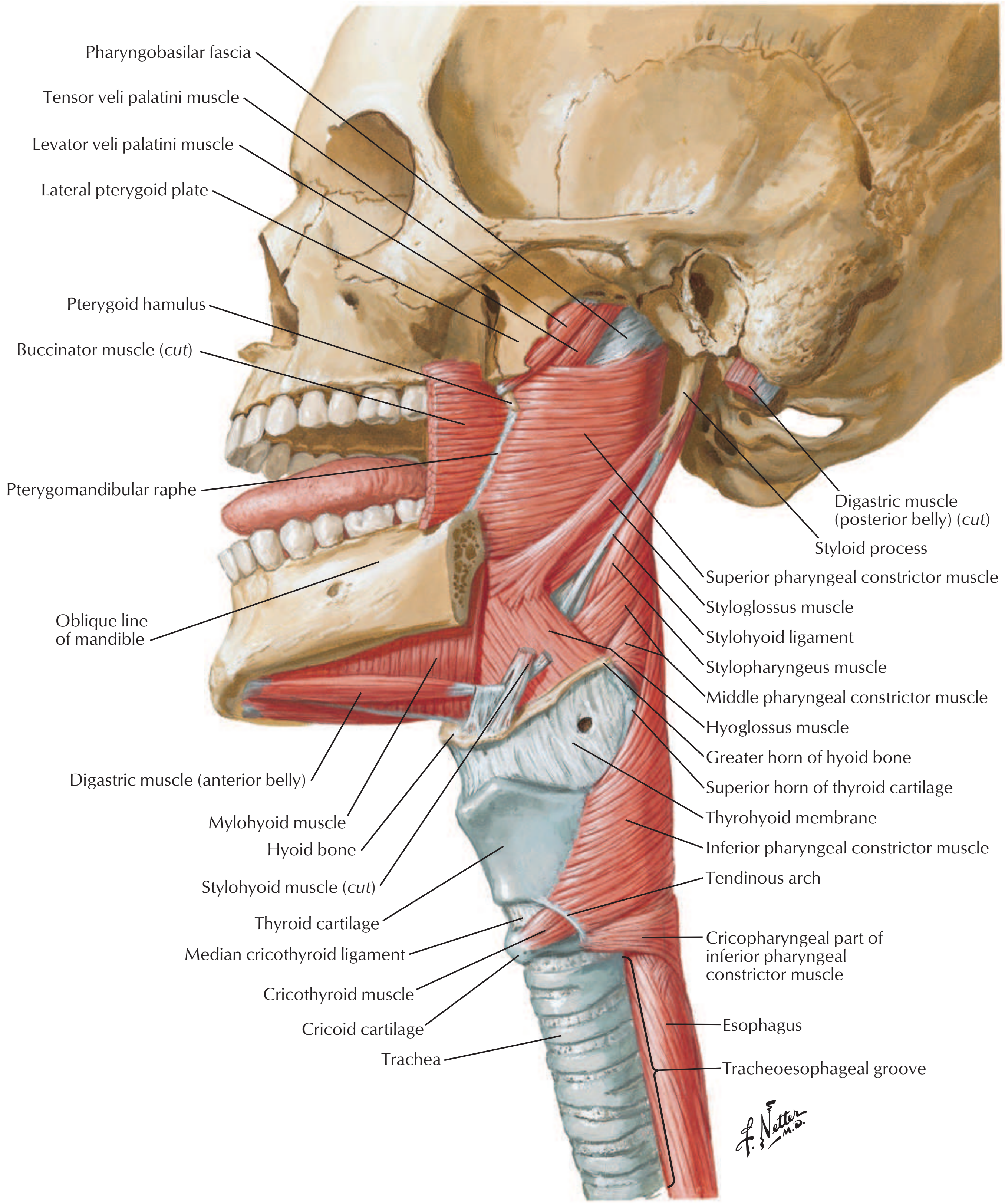

Medial pterygoid plate
Cartilaginous part of auditory tube (eustachian)
Tensor veli palatini muscle
Pharyngobasilar fascia
Levator veli palatini muscle
Palatine aponeurosis and tendon of tensor veli palatini muscle
Pharyngeal tubercle (basilar part of occipital bone)
Pharyngeal raphe
Anterior longitudinal ligament
Anterior atlantooccipital membrane
Apical ligament of dens
Salpingopharyngeus muscle
Muscles of soft palate
Palatopharyngeal ridge (Passavant's ridge)
Pterygoid hamulus
Superior pharyngeal constrictor muscle
Pterygomandibular raphe
Palatopharyngeus muscle
Buccinator muscle
Glossopharyngeal part of superior pharyngeal constrictor muscle
Stylopharyngeus muscle
Stylohyoid ligament
Styloglossus muscle
Middle pharyngeal constrictor muscle
Fibers to pharyngoepiglottic fold
Buccopharyngeal fascia and retropharyngeal space
Prevertebral fascia and anterior longitudinal ligament
Internal branch of superior laryngeal nerve
Longitudinal pharyngeal muscles
Inferior pharyngeal constrictor muscle
Cricopharyngeal muscle (part of inferior pharyngeal constrictor muscle)
Circular esophageal muscle
Longitudinal esophageal muscle
C1
C2
C3
C4
C5
C6
C7
Hyoglossus muscle
Geniohyoid muscle
Mylohyoid muscle
Hyoid bone
Thyrohyoid membrane
Thyroid cartilage
Median cricothyroid ligament
Corniculate and arytenoid cartilages
Cricoid cartilage
Trachea
F. Netter M.D.


Choanae
Basilar part of occipital bone
Pharyngeal tonsil
Styloid process
Nasal septum
Torus tubarius
Pharyngeal opening of auditory tube (eustachian)
Pharyngeal recess
Parotid gland
Torus levatorius (fold caused by levator veli palatini muscle)
Inferior nasal concha
Salpingopharyngeal fold
Soft palate
Angle of mandible
Submandibular gland
Uvula of the palate
Palatine tonsil
Root of tongue
Palatopharyngeal arch
Prominence caused by greater horn of hyoid bone
Epiglottis
Laryngeal inlet
Prominence caused by superior horn of thyroid cartilage
Aryepiglottic fold
Piriform recess
Cuneiform tubercle
Fold over internal branch of superior laryngeal nerve
Corniculate tubercle
Interarytenoid notch
Prominence over lamina of cricoid cartilage
Nasopharynx
Oropharynx
Laryngopharynx
Esophagus
Trachea

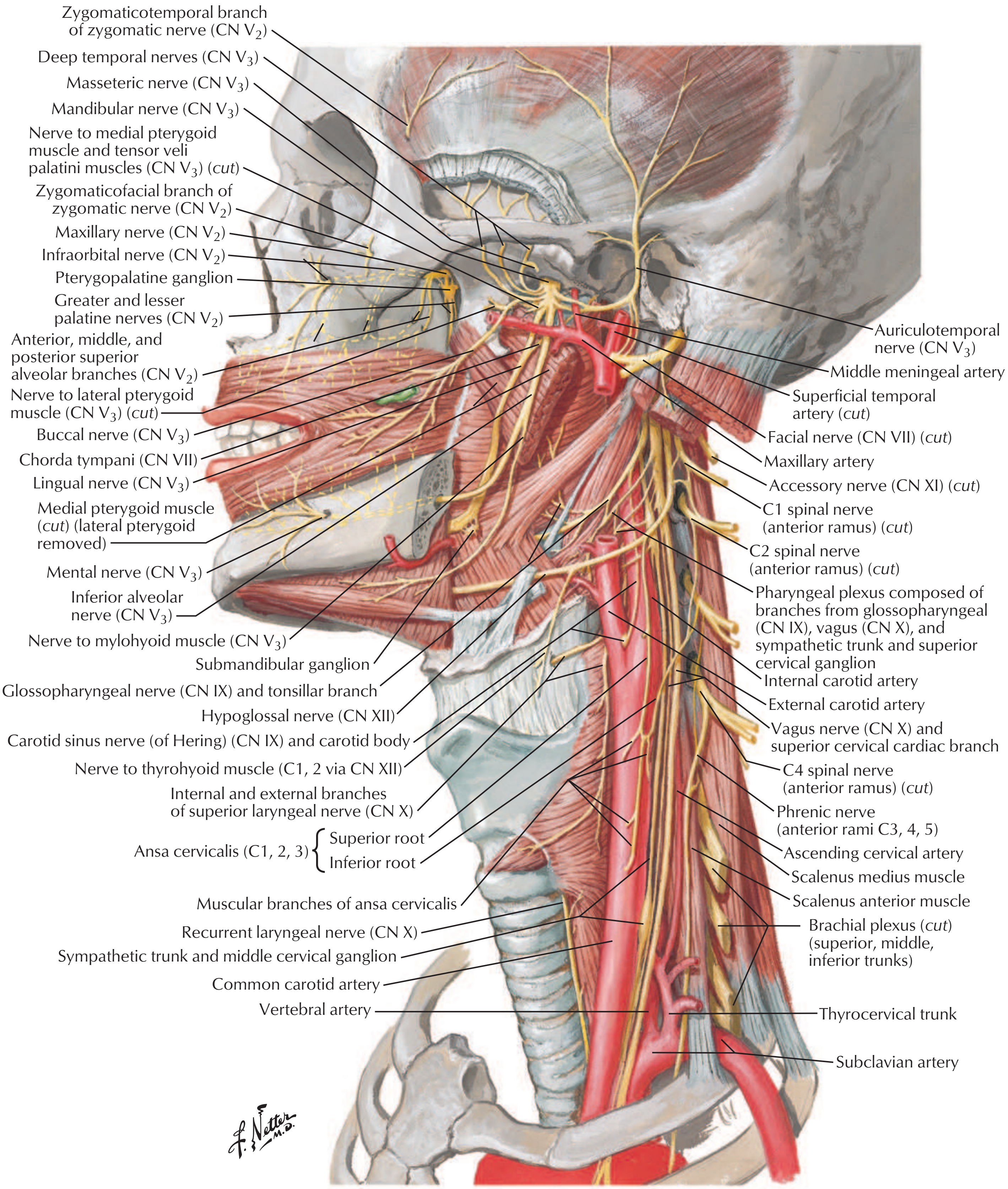

Superior pharyngeal constrictor muscle
Root of tongue
Epiglottis
Middle pharyngeal constrictor muscle
Palatopharyngeus muscle
Stylopharyngeus muscle
Longitudinal pharyngeal muscles
Pharyngoepiglottic fold
Laryngeal inlet
Thyroid cartilage (superior horn)
Thyrohyoid membrane
Internal branch of superior laryngeal nerve and superior laryngeal artery and vein
Oblique arytenoid muscle
Transverse arytenoid muscle
Thyroid cartilage
Posterior cricoarytenoid muscle
Inferior pharyngeal constrictor muscle (thyropharyngeus muscle)
Pharyngeal aponeurosis (cut away)
Zone of sparse muscle fibers
Cricopharyngeal part of inferior pharyngeal constrictor muscle
Cricoid cartilage (lamina)
Cricoesophageal tendon
Esophageal mucosa and submucosa
Circular muscle in V-shaped area (of Laimer)
Right recurrent laryngeal nerve
Longitudinal esophageal muscle
Window cut in longitudinal muscle exposes circular muscle layer
F. Netter M.D.

Posterior view with pharynx opened and mucosa removed

See also **Plate 75**

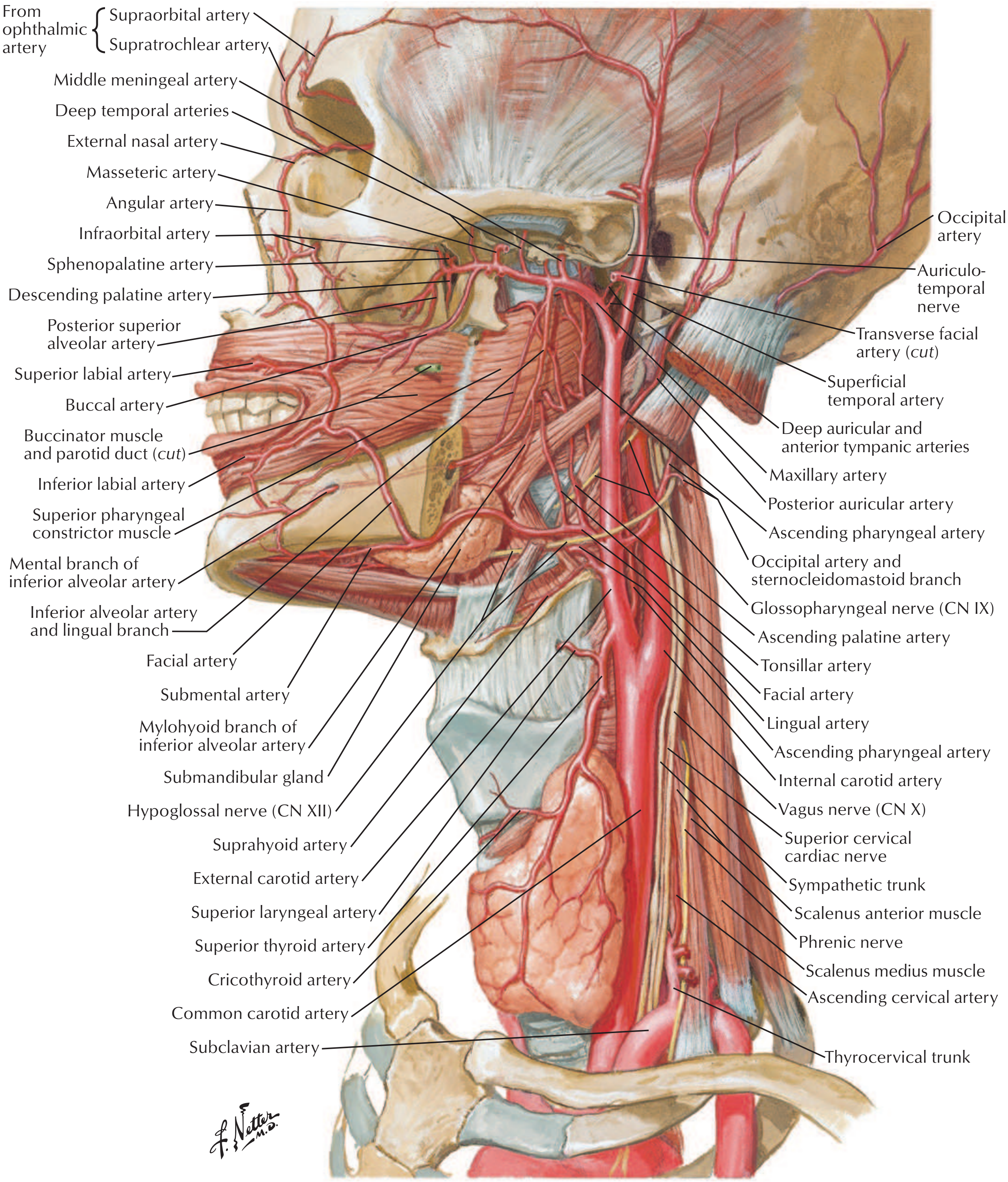

Pharyngobasilar fascia
Tensor veli palatini muscle
Levator veli palatini muscle
Lateral pterygoid plate
Pterygoid hamulus
Buccinator muscle (*cut*)
Pterygomandibular raphe
Oblique line
of mandible
Digastric muscle (anterior belly)
Mylohyoid muscle
Hyoid bone
Stylohyoid muscle (*cut*)
Thyroid cartilage
Median cricothyroid ligament
Cricothyroid muscle
Cricoid cartilage
Trachea
Digastric muscle
(posterior belly) (*cut*)
Styloid process
Superior pharyngeal constrictor muscle
Styloglossus muscle
Stylohyoid ligament
Stylopharyngeus muscle
Middle pharyngeal constrictor muscle
Hyoglossus muscle
Greater horn of hyoid bone
Superior horn of thyroid cartilage
Thyrohyoid membrane
Inferior pharyngeal constrictor muscle
Tendinous arch
Cricopharyngeal part of
inferior pharyngeal
constrictor muscle
Esophagus
Tracheoesophageal groove
F. Netter M.D.

See also Plates 59, 133, 136


Zygomaticotemporal branch of zygomatic nerve (CN V$_2$)
Deep temporal nerves (CN V$_3$)
Masseteric nerve (CN V$_3$)
Mandibular nerve (CN V$_3$)
Nerve to medial pterygoid muscle and tensor veli palatini muscles (CN V$_3$) (*cut*)
Zygomaticofacial branch of zygomatic nerve (CN V$_2$)
Maxillary nerve (CN V$_2$)
Infraorbital nerve (CN V$_2$)
Pterygopalatine ganglion
Greater and lesser palatine nerves (CN V$_2$)
Anterior, middle, and posterior superior alveolar branches (CN V$_2$)
Nerve to lateral pterygoid muscle (CN V$_3$) (*cut*)
Buccal nerve (CN V$_3$)
Chorda tympani (CN VII)
Lingual nerve (CN V$_3$)
Medial pterygoid muscle (*cut*) (lateral pterygoid removed)
Mental nerve (CN V$_3$)
Inferior alveolar nerve (CN V$_3$)
Nerve to mylohyoid muscle (CN V$_3$)
Submandibular ganglion
Glossopharyngeal nerve (CN IX) and tonsillar branch
Hypoglossal nerve (CN XII)
Carotid sinus nerve (of Hering) (CN IX) and carotid body
Nerve to thyrohyoid muscle (C1, 2 via CN XII)
Internal and external branches of superior laryngeal nerve (CN X)
Ansa cervicalis (C1, 2, 3) { Superior root
Inferior root
Muscular branches of ansa cervicalis
Recurrent laryngeal nerve (CN X)
Sympathetic trunk and middle cervical ganglion
Common carotid artery
Vertebral artery
Auriculotemporal nerve (CN V$_3$)
Middle meningeal artery
Superficial temporal artery (*cut*)
Facial nerve (CN VII) (*cut*)
Maxillary artery
Accessory nerve (CN XI) (*cut*)
C1 spinal nerve (anterior ramus) (*cut*)
C2 spinal nerve (anterior ramus) (*cut*)
Pharyngeal plexus composed of branches from glossopharyngeal (CN IX), vagus (CN X), and sympathetic trunk and superior cervical ganglion
Internal carotid artery
External carotid artery
Vagus nerve (CN X) and superior cervical cardiac branch
C4 spinal nerve (anterior ramus) (*cut*)
Phrenic nerve (anterior rami C3, 4, 5)
Ascending cervical artery
Scalenus medius muscle
Scalenus anterior muscle
Brachial plexus (*cut*) (superior, middle, inferior trunks)
Thyrocervical trunk
Subclavian artery
F. Netter M.D.

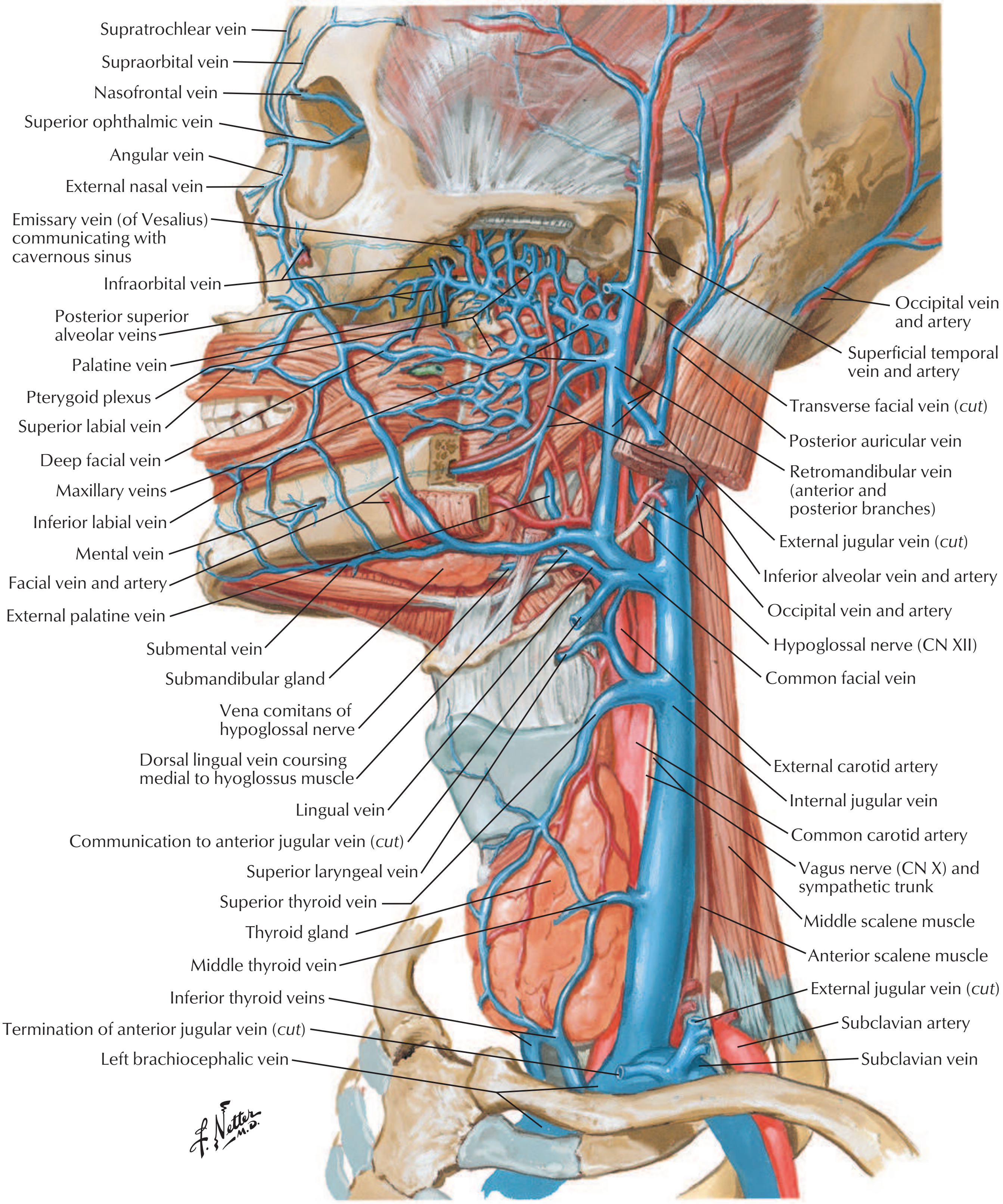
Arteries of Oral and Pharyngeal Regions

See also Plates 41, 57


From ophthalmic artery
Supraorbital artery
Supratrochlear artery
Middle meningeal artery
Deep temporal arteries
External nasal artery
Masseteric artery
Angular artery
Infraorbital artery
Sphenopalatine artery
Descending palatine artery
Posterior superior alveolar artery
Superior labial artery
Buccal artery
Buccinator muscle and parotid duct (cut)
Inferior labial artery
Superior pharyngeal constrictor muscle
Mental branch of inferior alveolar artery
Inferior alveolar artery and lingual branch
Facial artery
Submental artery
Mylohyoid branch of inferior alveolar artery
Submandibular gland
Hypoglossal nerve (CN XII)
Suprahyoid artery
External carotid artery
Superior laryngeal artery
Superior thyroid artery
Cricothyroid artery
Common carotid artery
Subclavian artery
Occipital artery
Auriculotemporal nerve
Transverse facial artery (cut)
Superficial temporal artery
Deep auricular and anterior tympanic arteries
Maxillary artery
Posterior auricular artery
Ascending pharyngeal artery
Occipital artery and sternocleidomastoid branch
Glossopharyngeal nerve (CN IX)
Ascending palatine artery
Tonsillar artery
Facial artery
Lingual artery
Ascending pharyngeal artery
Internal carotid artery
Vagus nerve (CN X)
Superior cervical cardiac nerve
Sympathetic trunk
Scalenus anterior muscle
Phrenic nerve
Scalenus medius muscle
Ascending cervical artery
Thyrocervical trunk

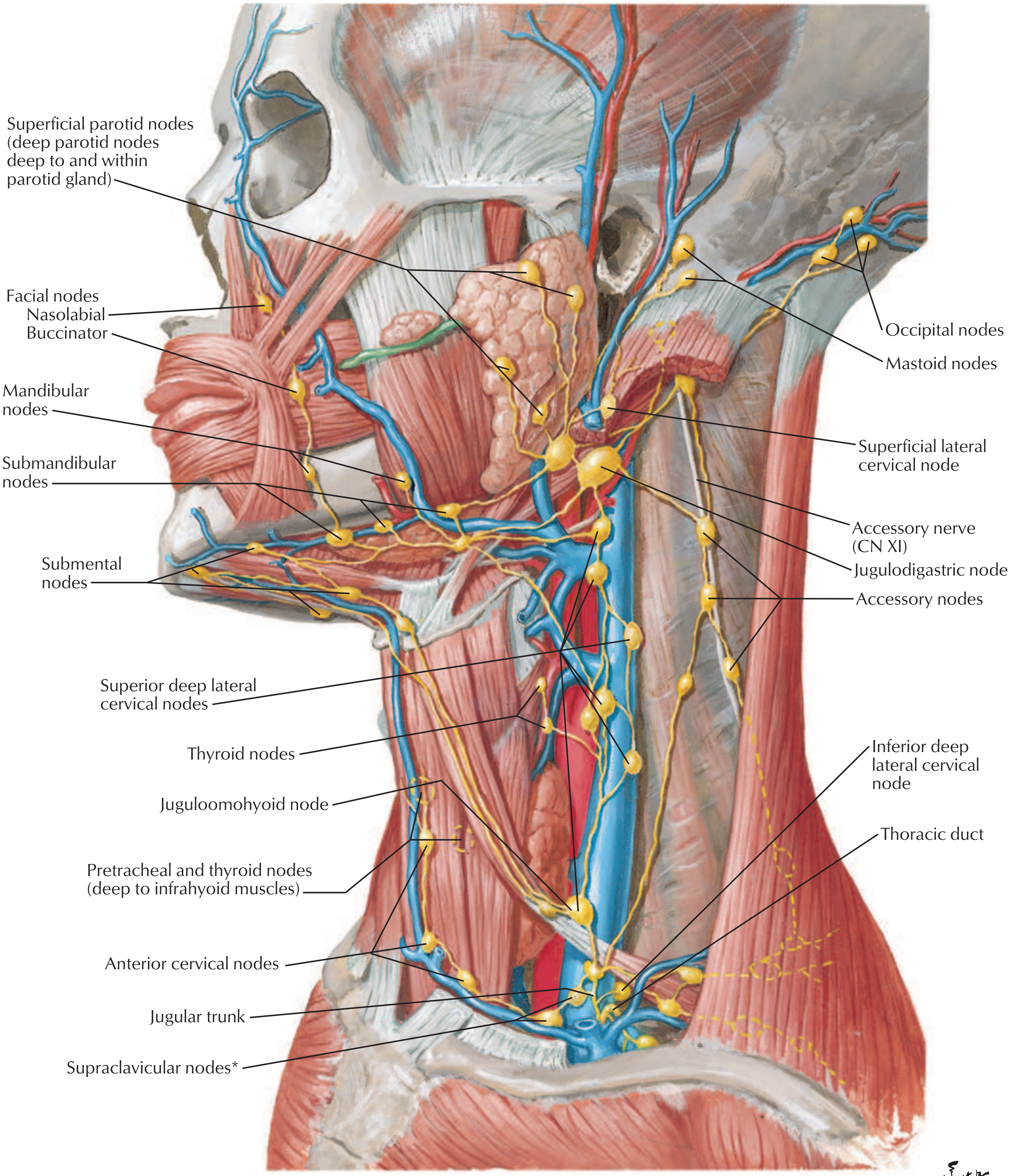
Veins of Face and Neck Regions

See also Plate 85


Supratrochlear vein
Supraorbital vein
Nasofrontal vein
Superior ophthalmic vein
Angular vein
External nasal vein
Emissary vein (of Vesalius) communicating with cavernous sinus
Infraorbital vein
Posterior superior alveolar veins
Palatine vein
Pterygoid plexus
Superior labial vein
Deep facial vein
Maxillary veins
Inferior labial vein
Mental vein
Facial vein and artery
External palatine vein
Submental vein
Submandibular gland
Vena comitans of hypoglossal nerve
Dorsal lingual vein coursing medial to hyoglossus muscle
Lingual vein
Communication to anterior jugular vein (*cut*)
Superior laryngeal vein
Superior thyroid vein
Thyroid gland
Middle thyroid vein
Inferior thyroid veins
Termination of anterior jugular vein (*cut*)
Left brachiocephalic vein
Occipital vein and artery
Superficial temporal vein and artery
Transverse facial vein (*cut*)
Posterior auricular vein
Retromandibular vein (anterior and posterior branches)
External jugular vein (*cut*)
Inferior alveolar vein and artery
Occipital vein and artery
Hypoglossal nerve (CN XII)
Common facial vein
External carotid artery
Internal jugular vein
Common carotid artery
Vagus nerve (CN X) and sympathetic trunk
Middle scalene muscle
Anterior scalene muscle
External jugular vein (*cut*)
Subclavian artery
Subclavian vein
F. Netter M.D.

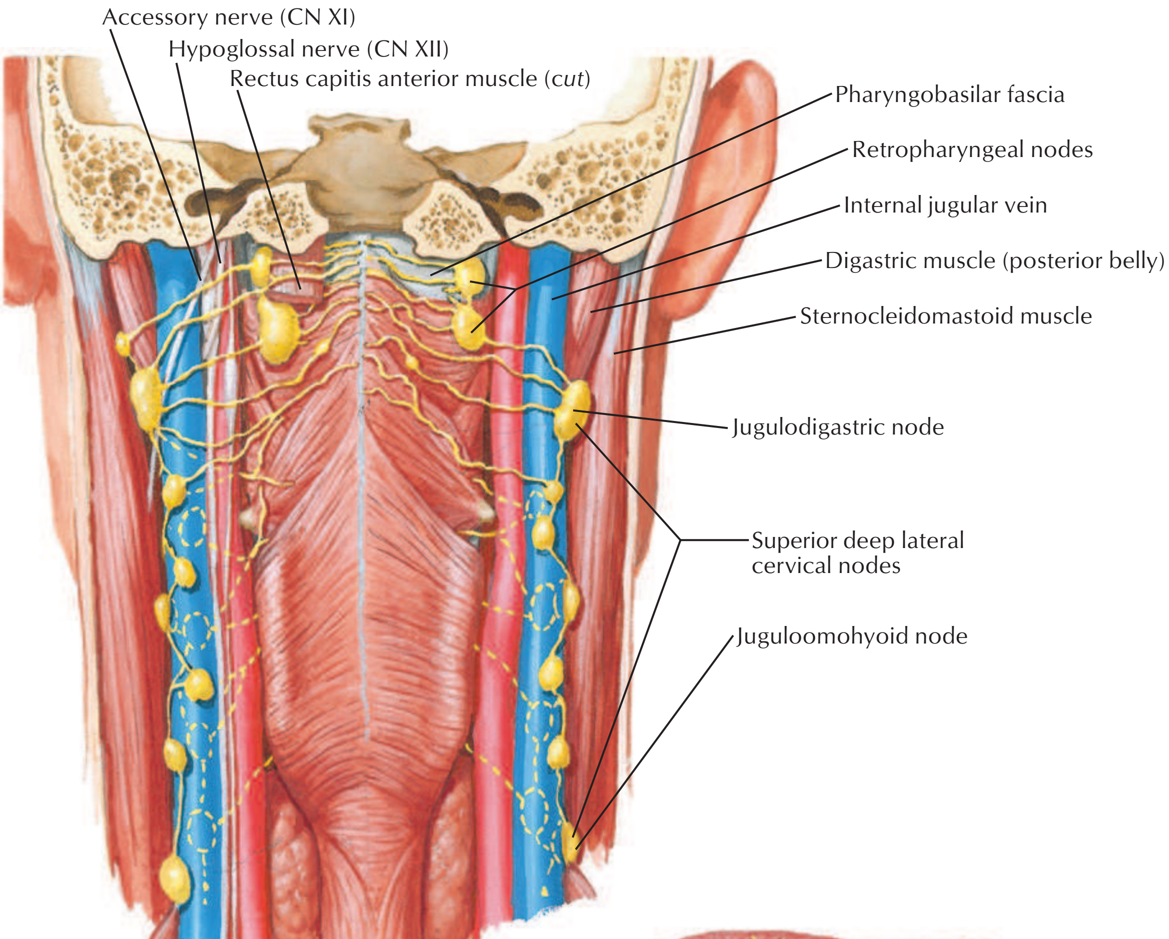
Lymph Vessels and Nodes of Head and Neck

See also **Plate 242**

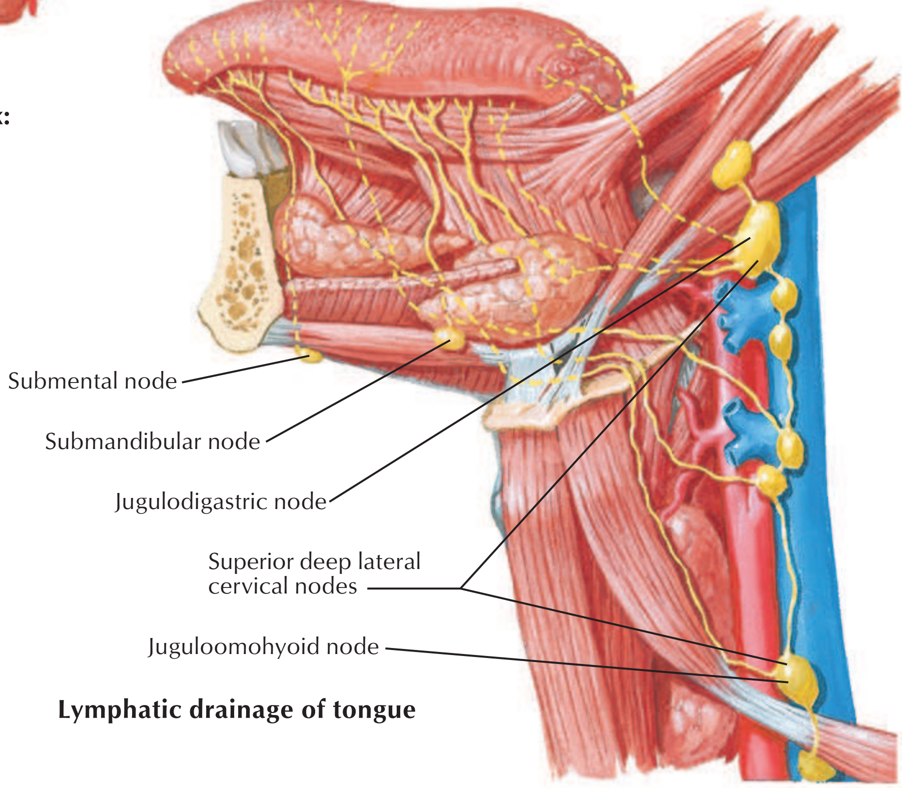


Superficial parotid nodes (deep parotid nodes deep to and within parotid gland)
Facial nodes
Nasolabial
Buccinator
Mandibular nodes
Submandibular nodes
Submental nodes
Superior deep lateral cervical nodes
Thyroid nodes
Juguloomohyoid node
Pretracheal and thyroid nodes (deep to infrahyoid muscles)
Anterior cervical nodes
Jugular trunk
Supraclavicular nodes*
Occipital nodes
Mastoid nodes
Superficial lateral cervical node
Accessory nerve (CN XI)
Jugulodigastric node
Accessory nodes
Inferior deep lateral cervical node
Thoracic duct

**The supraclavicular group of nodes, especially on the left, are also sometimes referred to as the signal or sentinel lymph nodes of Virchow or Troisier, especially when sufficiently enlarged and palpable. These nodes (or a single node) are so termed because they may be the first recognized presumptive evidence of malignant disease in the viscera.*

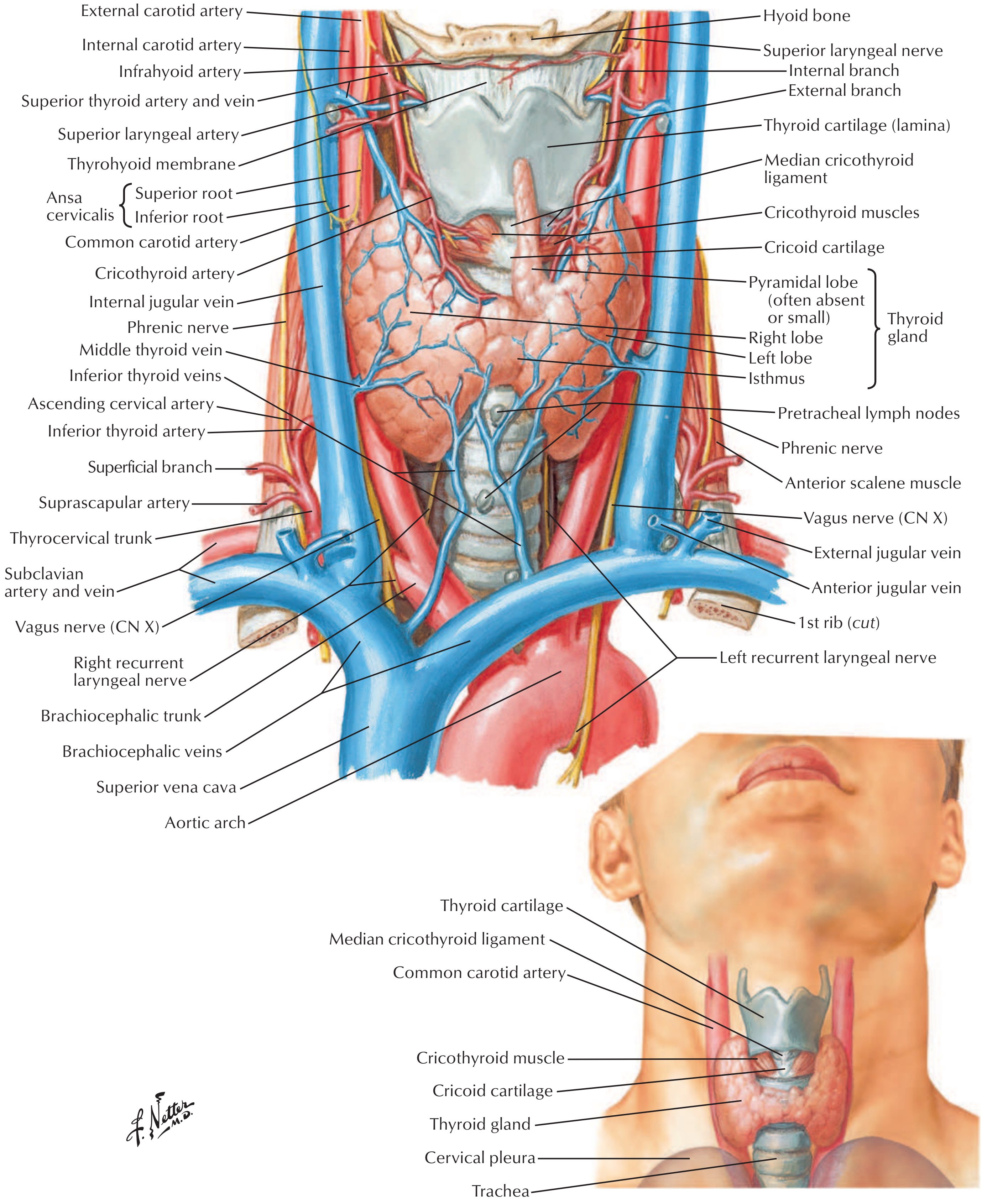

Accessory nerve (CN XI)
Hypoglossal nerve (CN XII)
Rectus capitis anterior muscle (*cut*)
Pharyngobasilar fascia
Retropharyngeal nodes
Internal jugular vein
Digastric muscle (posterior belly)
Sternocleidomastoid muscle
Jugulodigastric node
Superior deep lateral cervical nodes
Juguloomohyoid node

Lymphatic drainage of pharynx: posterior view


Submental node
Submandibular node
Jugulodigastric node
Superior deep lateral cervical nodes
Juguloomohyoid node
F. Netter M.D.

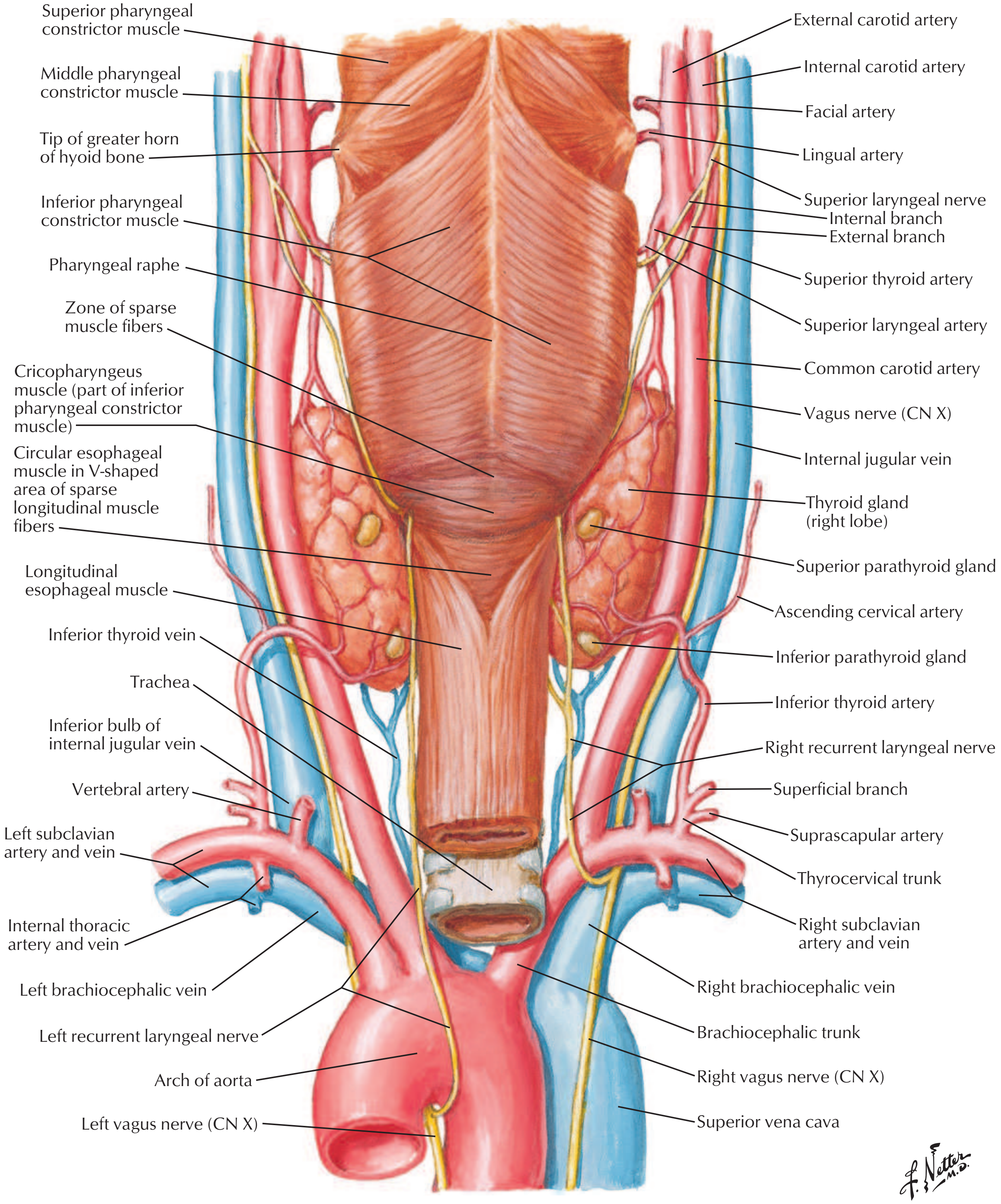
Lymphatic drainage of tongue

Thyroid Gland: Anterior View


External carotid artery
Internal carotid artery
Infrahyoid artery
Superior thyroid artery and vein
Superior laryngeal artery
Thyrohyoid membrane
Ansa cervicalis
Superior root
Inferior root
Common carotid artery
Cricothyroid artery
Internal jugular vein
Phrenic nerve
Middle thyroid vein
Inferior thyroid veins
Ascending cervical artery
Inferior thyroid artery
Superficial branch
Suprascapular artery
Thyrocervical trunk
Subclavian artery and vein
Vagus nerve (CN X)
Right recurrent laryngeal nerve
Brachiocephalic trunk
Brachiocephalic veins
Superior vena cava
Aortic arch
Hyoid bone
Superior laryngeal nerve
Internal branch
External branch
Thyroid cartilage (lamina)
Median cricothyroid ligament
Cricothyroid muscles
Cricoid cartilage
Pyramidal lobe (often absent or small)
Right lobe
Left lobe
Isthmus
Thyroid gland
Pretracheal lymph nodes
Phrenic nerve
Anterior scalene muscle
Vagus nerve (CN X)
External jugular vein
Anterior jugular vein
1st rib (*cut*)
Left recurrent laryngeal nerve
Thyroid cartilage
Median cricothyroid ligament
Common carotid artery
Cricothyroid muscle
Cricoid cartilage
Thyroid gland
Cervical pleura
Trachea

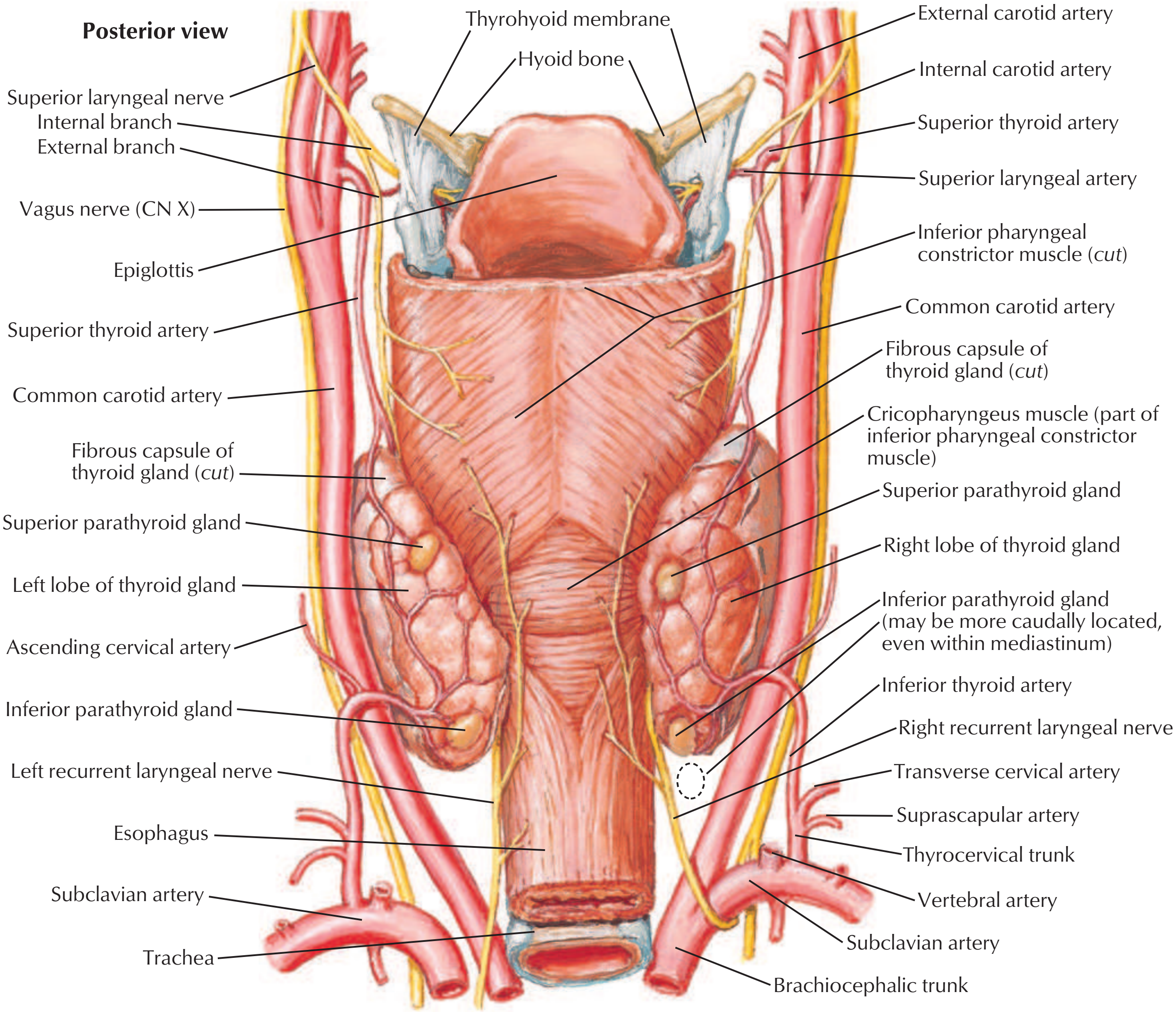
Thyroid Gland and Pharynx: Posterior View

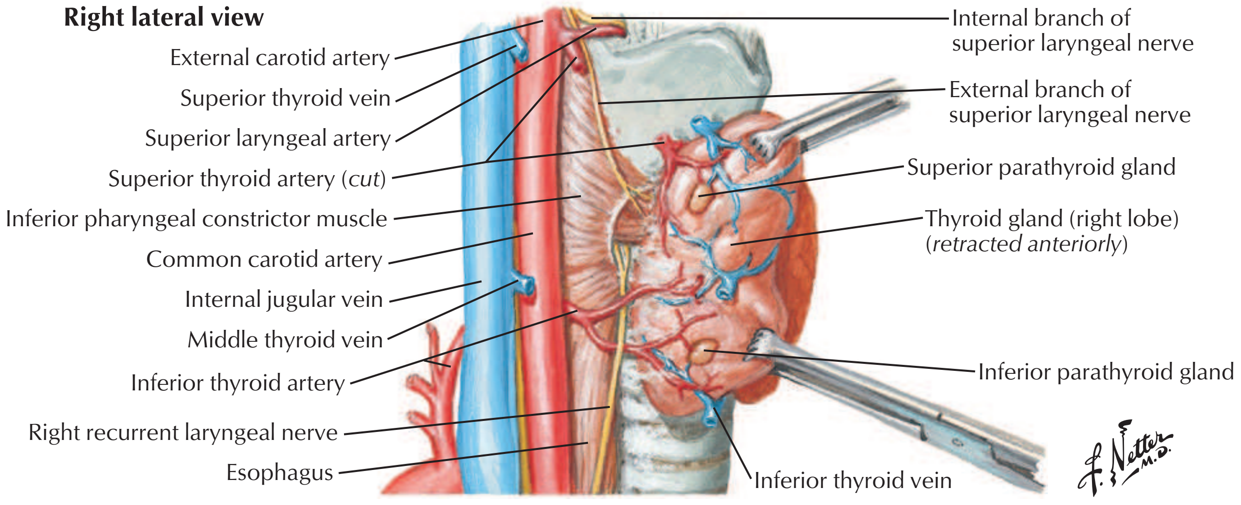
See also Plate 89


Superior pharyngeal constrictor muscle
Middle pharyngeal constrictor muscle
Tip of greater horn of hyoid bone
Inferior pharyngeal constrictor muscle
Pharyngeal raphe
Zone of sparse muscle fibers
Cricopharyngeus muscle (part of inferior pharyngeal constrictor muscle)
Circular esophageal muscle in V-shaped area of sparse longitudinal muscle fibers
Longitudinal esophageal muscle
Inferior thyroid vein
Trachea
Inferior bulb of internal jugular vein
Vertebral artery
Left subclavian artery and vein
Internal thoracic artery and vein
Left brachiocephalic vein
Left recurrent laryngeal nerve
Arch of aorta
Left vagus nerve (CN X)
External carotid artery
Internal carotid artery
Facial artery
Lingual artery
Superior laryngeal nerve
Internal branch
External branch
Superior thyroid artery
Superior laryngeal artery
Common carotid artery
Vagus nerve (CN X)
Internal jugular vein
Thyroid gland (right lobe)
Superior parathyroid gland
Ascending cervical artery
Inferior parathyroid gland
Inferior thyroid artery
Right recurrent laryngeal nerve
Superficial branch
Suprascapular artery
Thyrocervical trunk
Right subclavian artery and vein
Right brachiocephalic vein
Brachiocephalic trunk
Right vagus nerve (CN X)
Superior vena cava
F. Netter M.D.

Parathyroid Glands

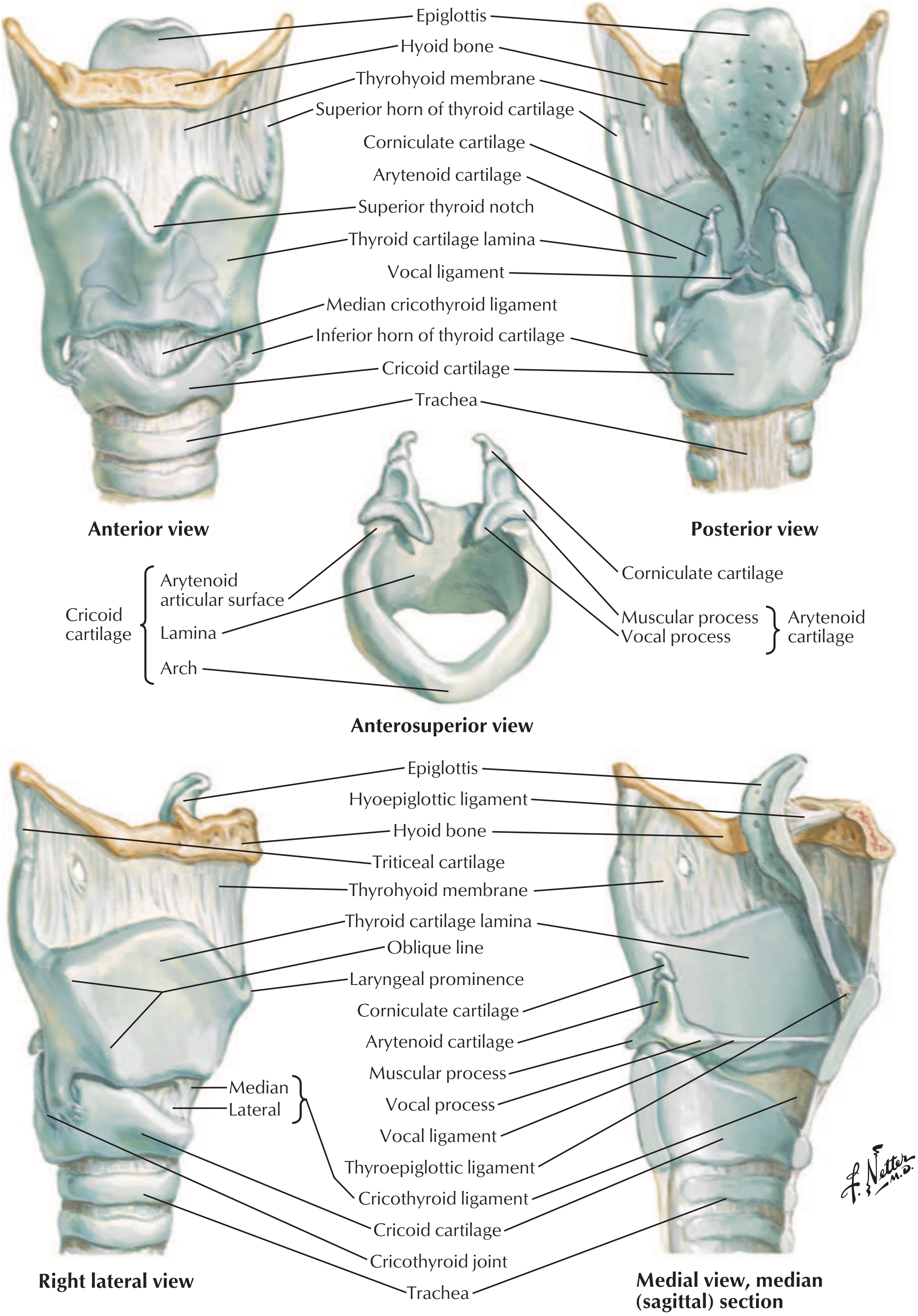
See also **Plates 80**, **88**, **92**


Posterior view
Thyrohyoid membrane
Hyoid bone
External carotid artery
Internal carotid artery
Superior laryngeal nerve
Internal branch
External branch
Superior thyroid artery
Superior laryngeal artery
Vagus nerve (CN X)
Epiglottis
Inferior pharyngeal constrictor muscle (*cut*)
Common carotid artery
Superior thyroid artery
Common carotid artery
Fibrous capsule of thyroid gland (*cut*)
Cricopharyngeus muscle (part of inferior pharyngeal constrictor muscle)
Fibrous capsule of thyroid gland (*cut*)
Superior parathyroid gland
Superior parathyroid gland
Right lobe of thyroid gland
Left lobe of thyroid gland
Inferior parathyroid gland (may be more caudally located, even within mediastinum)
Ascending cervical artery
Inferior thyroid artery
Inferior parathyroid gland
Right recurrent laryngeal nerve
Left recurrent laryngeal nerve
Transverse cervical artery
Suprascapular artery
Esophagus
Thyrocervical trunk
Vertebral artery
Subclavian artery
Subclavian artery
Trachea
Brachiocephalic trunk


Right lateral view
Internal branch of superior laryngeal nerve
External carotid artery
Superior thyroid vein
External branch of superior laryngeal nerve
Superior laryngeal artery
Superior thyroid artery (*cut*)
Superior parathyroid gland
Inferior pharyngeal constrictor muscle
Thyroid gland (right lobe) (*retracted anteriorly*)
Common carotid artery
Internal jugular vein
Middle thyroid vein
Inferior thyroid artery
Inferior parathyroid gland
Right recurrent laryngeal nerve
Esophagus
Inferior thyroid vein

Cartilages of Larynx

See also Plates 91, 92, 93


Epiglottis
Hyoid bone
Thyrohyoid membrane
Superior horn of thyroid cartilage
Corniculate cartilage
Arytenoid cartilage
Superior thyroid notch
Thyroid cartilage lamina
Vocal ligament
Median cricothyroid ligament
Inferior horn of thyroid cartilage
Cricoid cartilage
Trachea
Cricoid cartilage
Arytenoid articular surface
Lamina
Arch
Corniculate cartilage
Muscular process
Vocal process
Arytenoid cartilage
Epiglottis
Hyoepiglottic ligament
Hyoid bone
Triticeal cartilage
Thyrohyoid membrane
Thyroid cartilage lamina
Oblique line
Laryngeal prominence
Corniculate cartilage
Arytenoid cartilage
Muscular process
Vocal process
Vocal ligament
Thyroepiglottic ligament
Median
Lateral
Cricothyroid ligament
Cricoid cartilage
Cricothyroid joint
Trachea

Anterior view

Posterior view

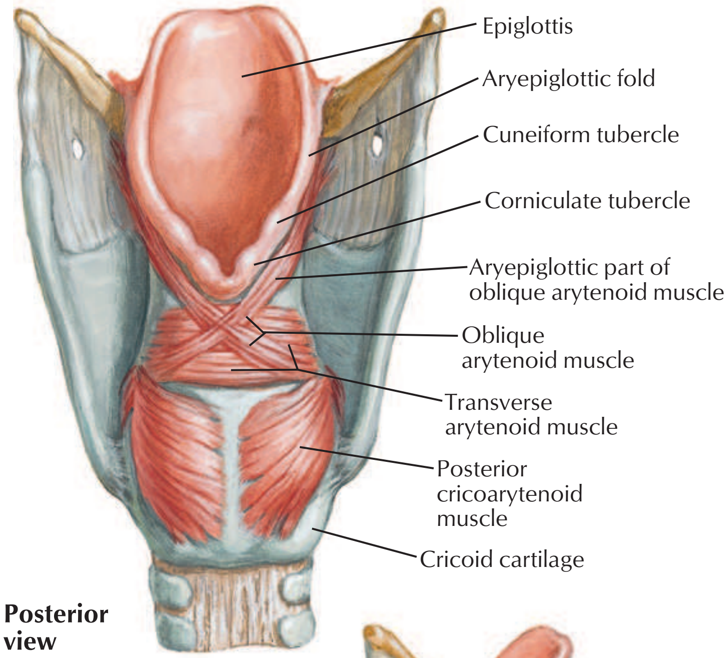
Anterosuperior view

Right lateral view

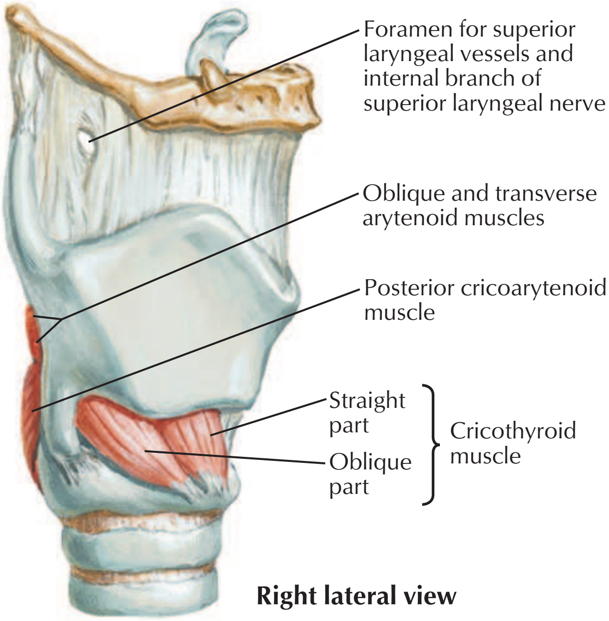
Medial view, median (sagittal) section

Intrinsic Muscles of Larynx

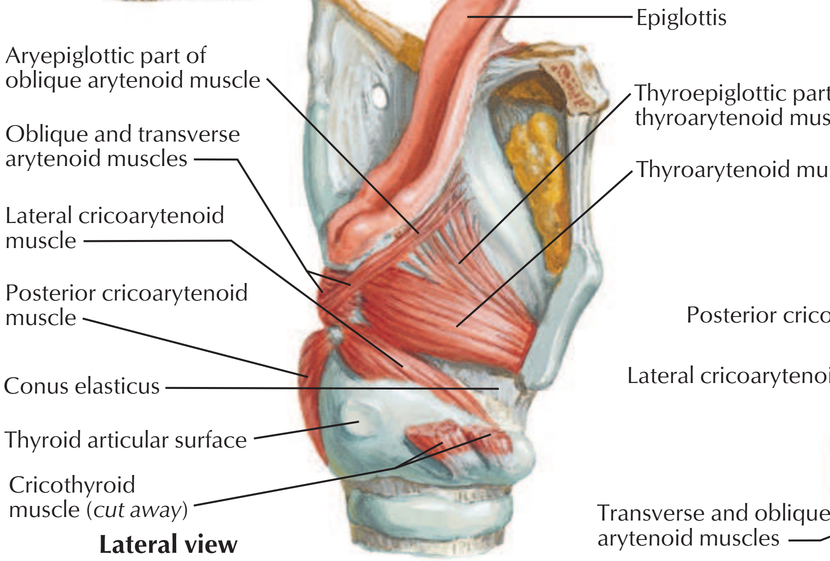
See also **Plates 90, 92, 93**


Epiglottis
Aryepiglottic fold
Cuneiform tubercle
Corniculate tubercle
Aryepiglottic part of oblique arytenoid muscle
Oblique arytenoid muscle
Transverse arytenoid muscle
Posterior cricoarytenoid muscle
Cricoid cartilage

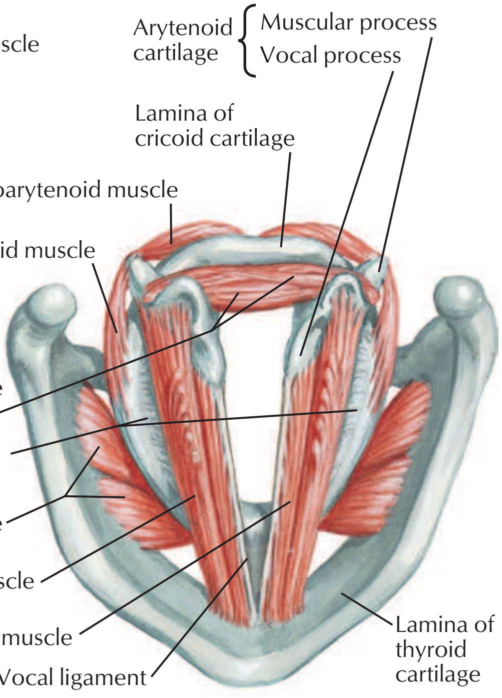
Posterior view


Foramen for superior laryngeal vessels and internal branch of superior laryngeal nerve
Oblique and transverse arytenoid muscles
Posterior cricoarytenoid muscle
Straight part
Oblique part
Cricothyroid muscle

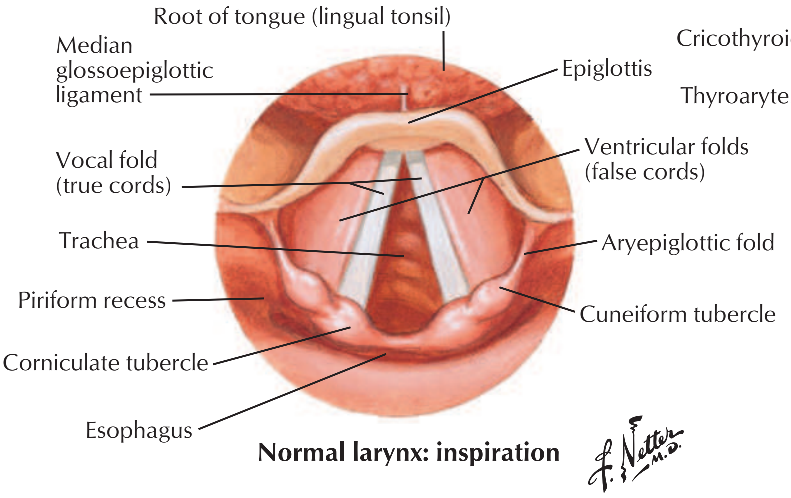
Right lateral view


Epiglottis
Aryepiglottic part of oblique arytenoid muscle
Thyroepiglottic part of thyroarytenoid muscle
Oblique and transverse arytenoid muscles
Thyroarytenoid muscle
Lateral cricoarytenoid muscle
Posterior cricoarytenoid muscle
Conus elasticus
Thyroid articular surface
Cricothyroid muscle (*cut away*)

Lateral view


Arytenoid cartilage
Muscular process
Vocal process
Lamina of cricoid cartilage
Posterior cricoarytenoid muscle
Lateral cricoarytenoid muscle
Transverse and oblique arytenoid muscles
Conus elasticus
Cricothyroid muscle
Thyroarytenoid muscle
Vocalis muscle
Vocal ligament
Lamina of thyroid cartilage

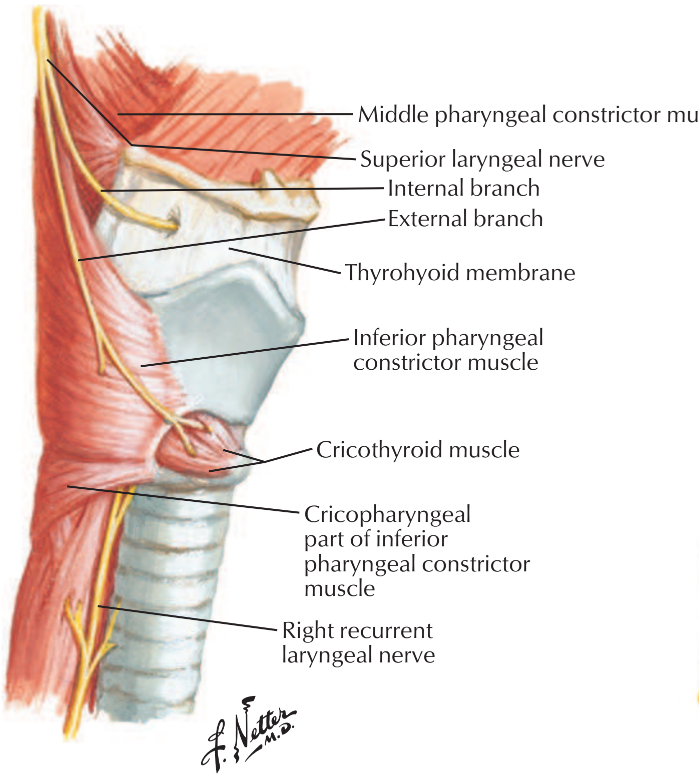
Superior view

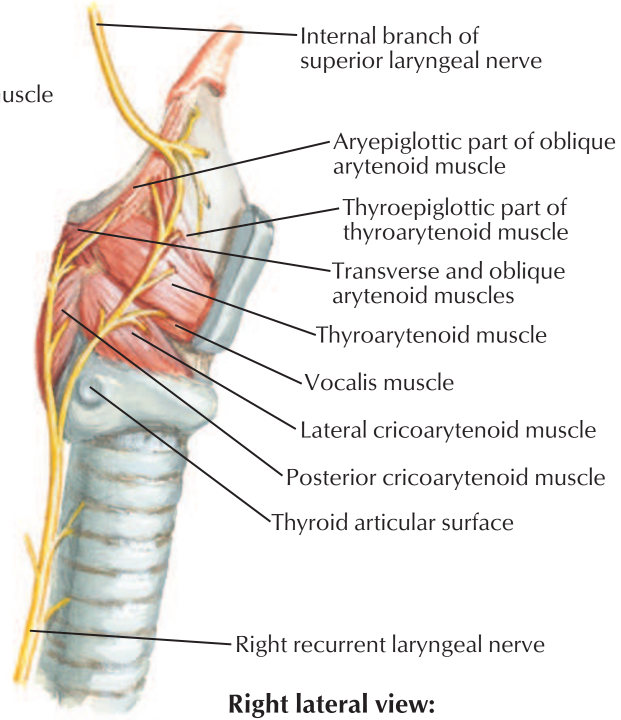

Root of tongue (lingual tonsil)
Median glossoepiglottic ligament
Epiglottis
Vocal fold (true cords)
Ventricular folds (false cords)
Trachea
Aryepiglottic fold
Piriform recess
Cuneiform tubercle
Corniculate tubercle
Esophagus

Normal larynx: inspiration

Nerves and Coronal Section of Larynx

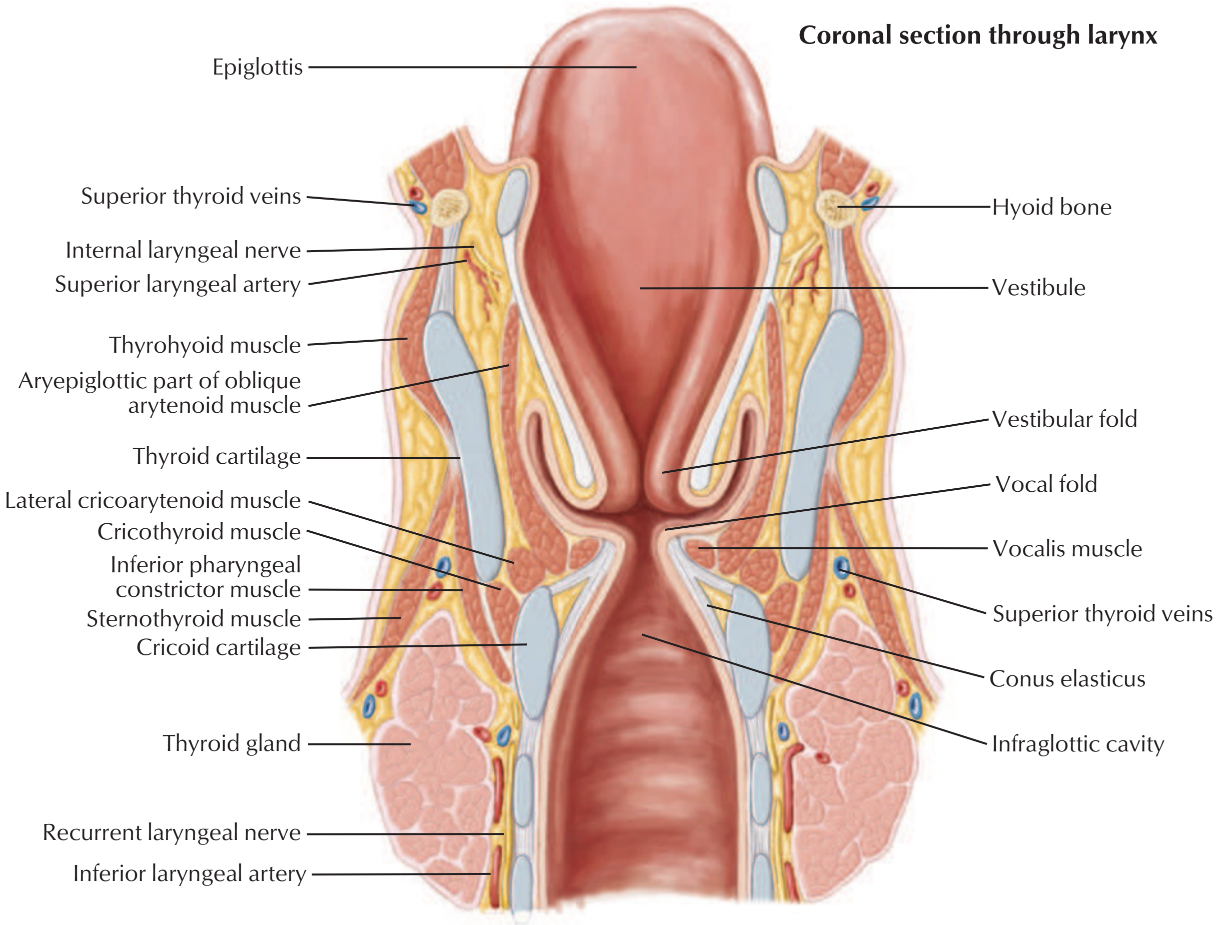
See also Plates 90, 91, 93


Middle pharyngeal constrictor muscle
Superior laryngeal nerve
Internal branch
External branch
Thyrohyoid membrane
Inferior pharyngeal constrictor muscle
Cricothyroid muscle
Cricopharyngeal part of inferior pharyngeal constrictor muscle
Right recurrent laryngeal nerve
F. Netter M.D.


Internal branch of superior laryngeal nerve
Aryepiglottic part of oblique arytenoid muscle
Thyroepiglottic part of thyroarytenoid muscle
Transverse and oblique arytenoid muscles
Thyroarytenoid muscle
Vocalis muscle
Lateral cricoarytenoid muscle
Posterior cricoarytenoid muscle
Thyroid articular surface
Right recurrent laryngeal nerve

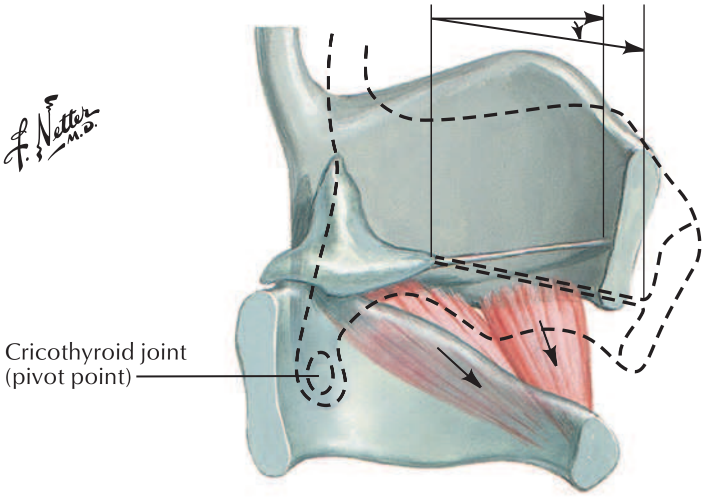
Right lateral view: thyroid cartilage lamina removed

Coronal section through larynx

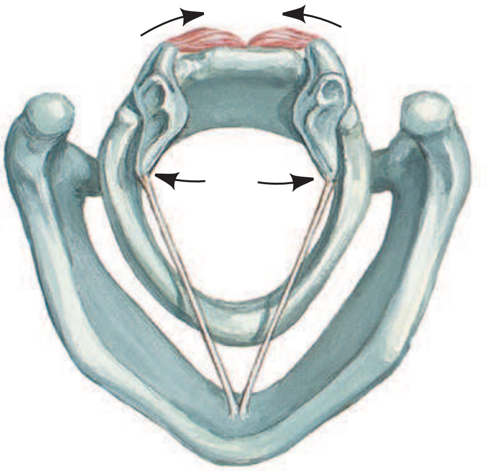

Epiglottis
Superior thyroid veins
Internal laryngeal nerve
Superior laryngeal artery
Thyrohyoid muscle
Aryepiglottic part of oblique arytenoid muscle
Thyroid cartilage
Lateral cricoarytenoid muscle
Cricothyroid muscle
Inferior pharyngeal constrictor muscle
Sternothyroid muscle
Cricoid cartilage
Thyroid gland
Recurrent laryngeal nerve
Inferior laryngeal artery
Hyoid bone
Vestibule
Vestibular fold
Vocal fold
Vocalis muscle
Superior thyroid veins
Conus elasticus
Infraglottic cavity

Action of Intrinsic Muscles of Larynx

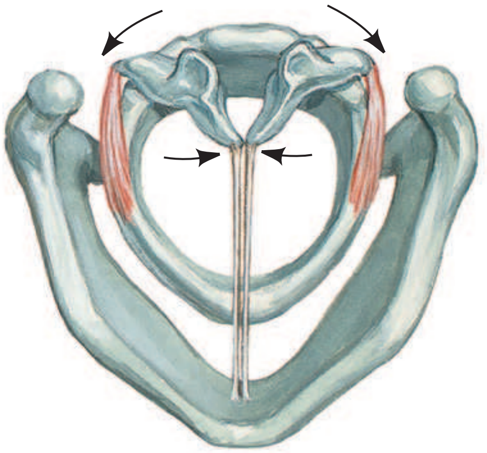
See also Plates 90, 91, 92



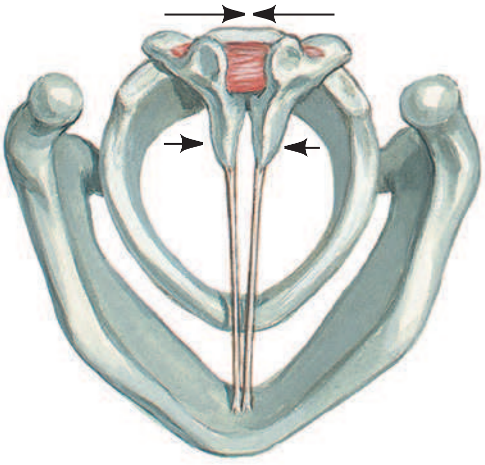
Action of cricothyroid muscles
Lengthening (increasing tension) of vocal ligaments



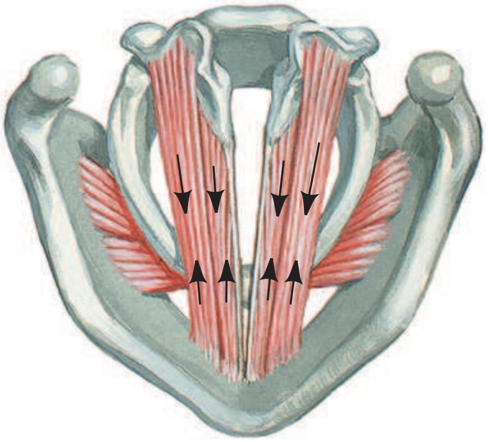
Action of posterior cricoarytenoid muscles
Abduction of vocal ligaments



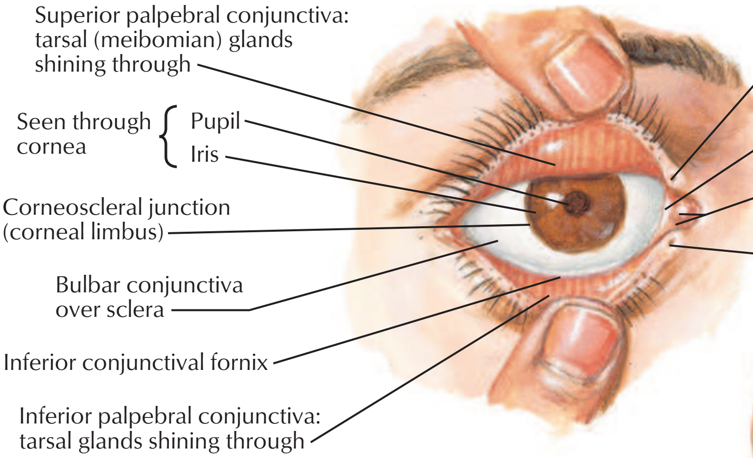
Action of lateral cricoarytenoid muscles
Adduction of vocal ligaments

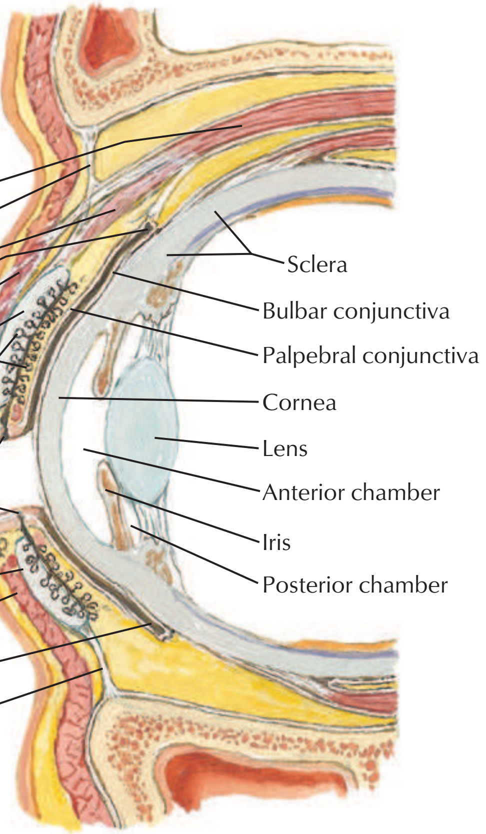


Action of transverse and oblique arytenoid muscles
Adduction of vocal ligaments



Action of vocalis and thyroarytenoid muscles
Shortening (relaxation) of vocal ligaments


Superior palpebral conjunctiva: tarsal (meibomian) glands shining through
Seen through cornea { Pupil
Iris
Corneoscleral junction (corneal limbus)
Bulbar conjunctiva over sclera
Inferior conjunctival fornix
Inferior palpebral conjunctiva: tarsal glands shining through
Superior lacrimal papilla and punctum
Plica semilunaris
Lacrimal caruncle in lacrimal lake (lacus lacrimalis)
Inferior lacrimal papilla and punctum


Levator palpebrae superioris muscle
Orbital septum
Superior tarsal (Müller's) muscle (smooth)
Superior conjunctival fornix
Orbicularis oculi muscle (palpebral part)
Superior tarsus
Tarsal (meibomian) glands
Sebaceous glands
Eyelashes (cilia)
Openings of tarsal glands
Inferior tarsus
Orbicularis oculi muscle (palpebral part)
Inferior conjunctival fornix
Orbital septum
Sclera
Bulbar conjunctiva
Palpebral conjunctiva
Cornea
Lens
Anterior chamber
Iris
Posterior chamber

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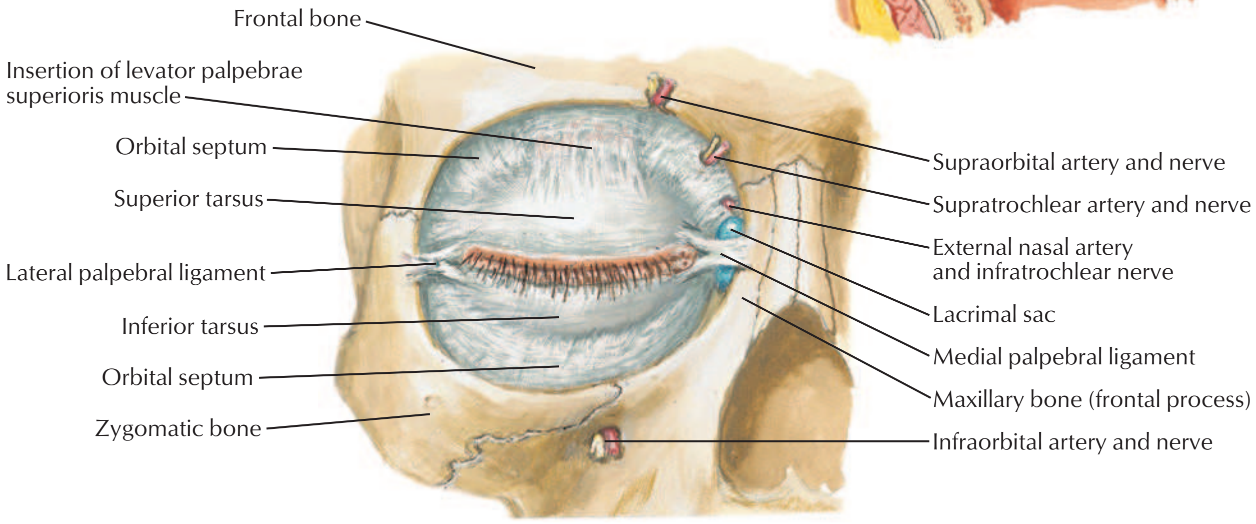
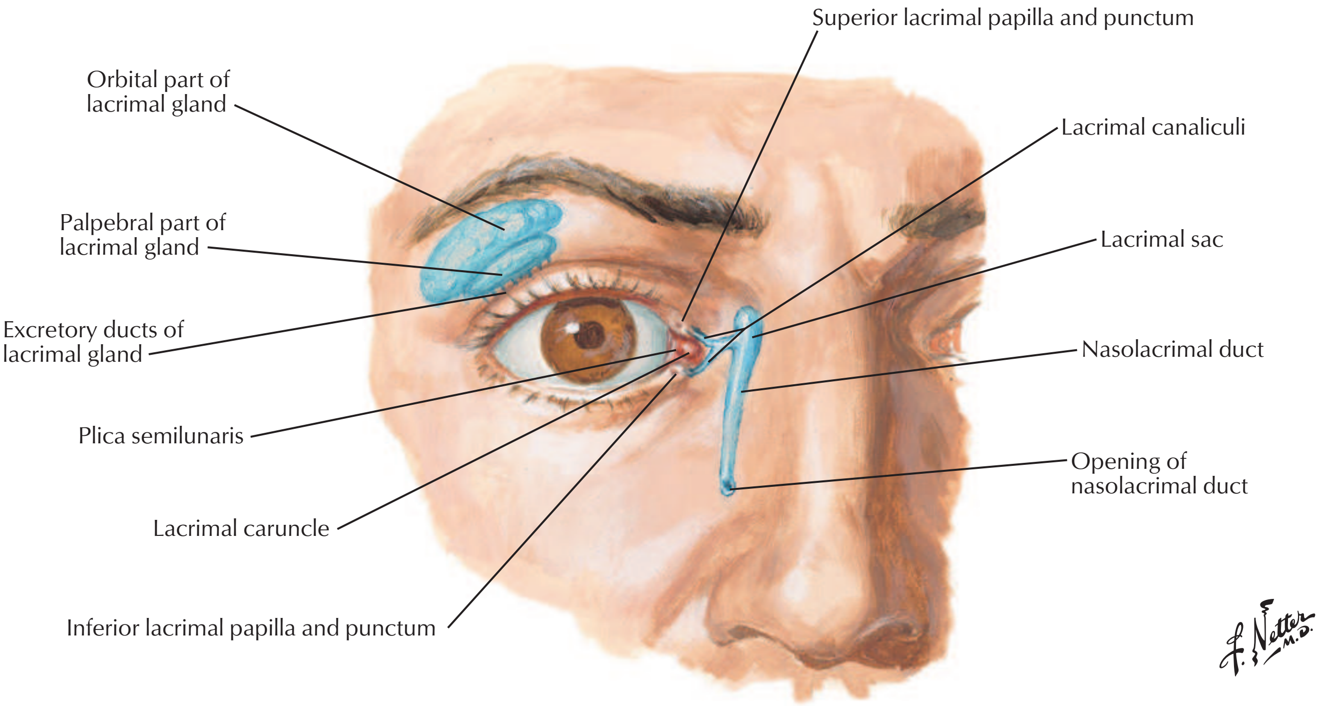
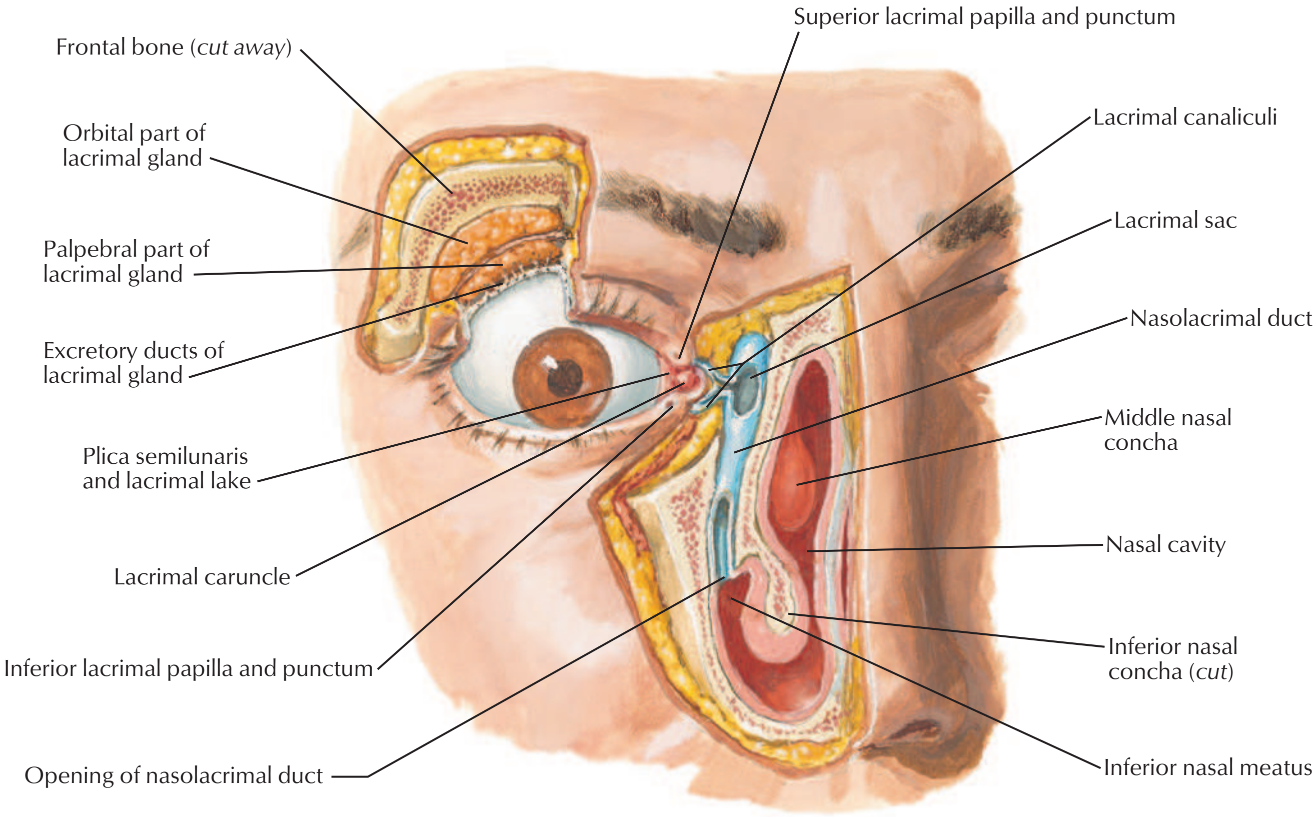

Frontal bone
Insertion of levator palpebrae superioris muscle
Orbital septum
Superior tarsus
Lateral palpebral ligament
Inferior tarsus
Orbital septum
Zygomatic bone
Supraorbital artery and nerve
Supratrochlear artery and nerve
External nasal artery and infratrochlear nerve
Lacrimal sac
Medial palpebral ligament
Maxillary bone (frontal process)
Infraorbital artery and nerve

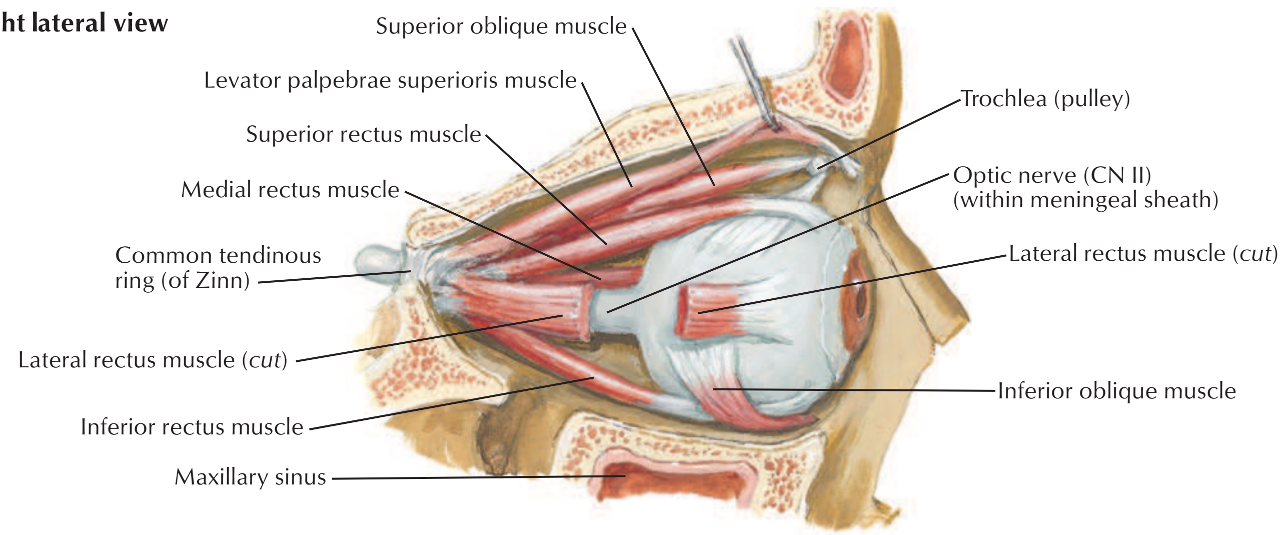
Lacrimal Apparatus

See also Plate 144

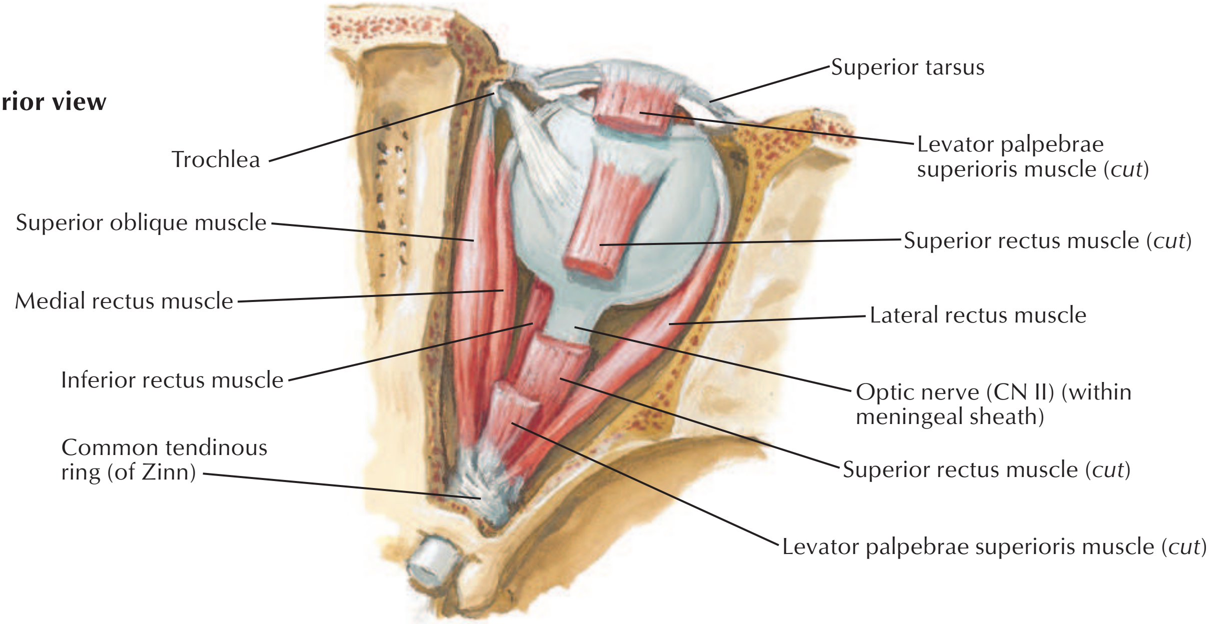

Orbital part of lacrimal gland
Palpebral part of lacrimal gland
Excretory ducts of lacrimal gland
Plica semilunaris
Lacrimal caruncle
Inferior lacrimal papilla and punctum
Superior lacrimal papilla and punctum
Lacrimal canaliculi
Lacrimal sac
Nasolacrimal duct
Opening of nasolacrimal duct
F. Netter M.D.


Frontal bone (*cut away*)
Orbital part of lacrimal gland
Palpebral part of lacrimal gland
Excretory ducts of lacrimal gland
Plica semilunaris and lacrimal lake
Lacrimal caruncle
Inferior lacrimal papilla and punctum
Opening of nasolacrimal duct
Superior lacrimal papilla and punctum
Lacrimal canaliculi
Lacrimal sac
Nasolacrimal duct
Middle nasal concha
Nasal cavity
Inferior nasal concha (*cut*)
Inferior nasal meatus

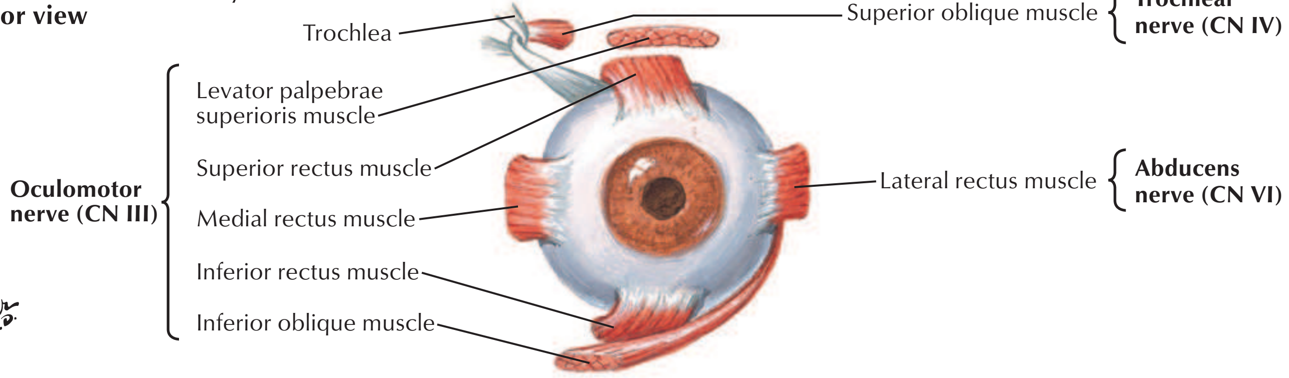
Right lateral view


Superior oblique muscle
Levator palpebrae superioris muscle
Superior rectus muscle
Medial rectus muscle
Common tendinous ring (of Zinn)
Lateral rectus muscle (*cut*)
Inferior rectus muscle
Maxillary sinus
Trochlea (pulley)
Optic nerve (CN II) (within meningeal sheath)
Lateral rectus muscle (*cut*)
Inferior oblique muscle

Superior view


Superior tarsus
Levator palpebrae superioris muscle (*cut*)
Trochlea
Superior oblique muscle
Superior rectus muscle (*cut*)
Medial rectus muscle
Lateral rectus muscle
Inferior rectus muscle
Optic nerve (CN II) (within meningeal sheath)
Common tendinous ring (of Zinn)
Superior rectus muscle (*cut*)
Levator palpebrae superioris muscle (*cut*)

Innervation of extrinsic eye muscles: anterior view


Trochlea
Superior oblique muscle
Trochlear nerve (CN IV)
Levator palpebrae superioris muscle
Superior rectus muscle
Oculomotor nerve (CN III)
Medial rectus muscle
Inferior rectus muscle
Inferior oblique muscle
Lateral rectus muscle
Abducens nerve (CN VI)

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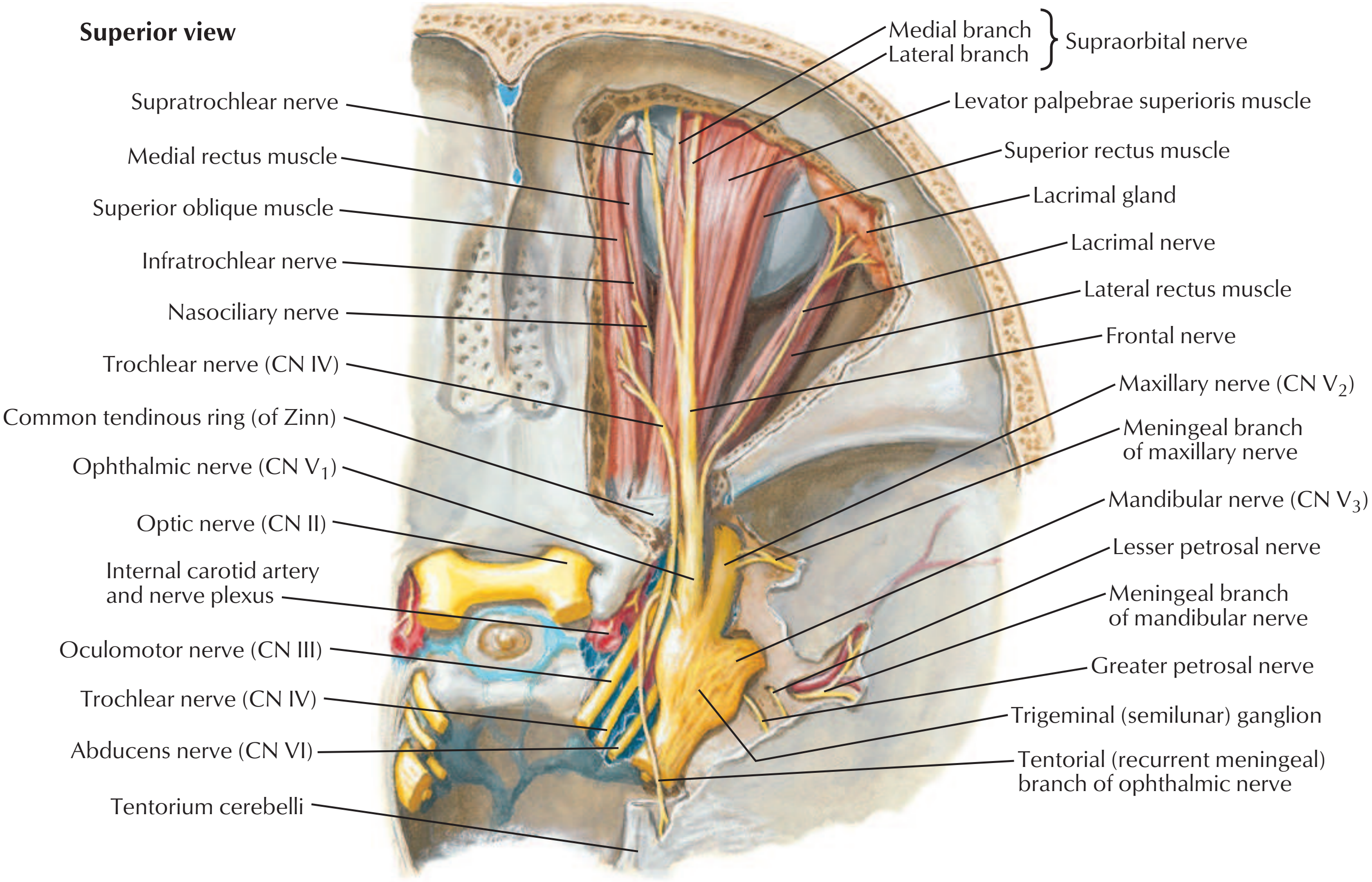
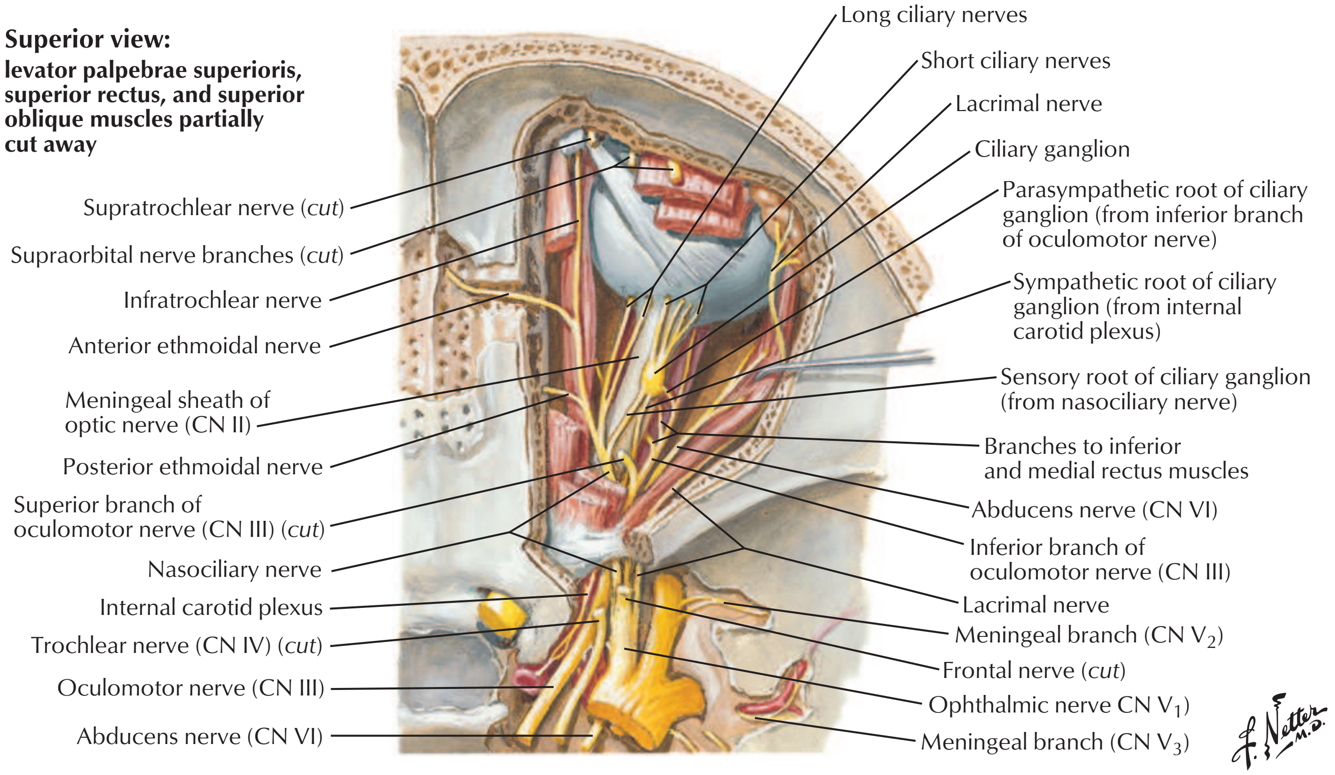
Nerves of Orbit

See also Plates 61, 132, 133



Superior view

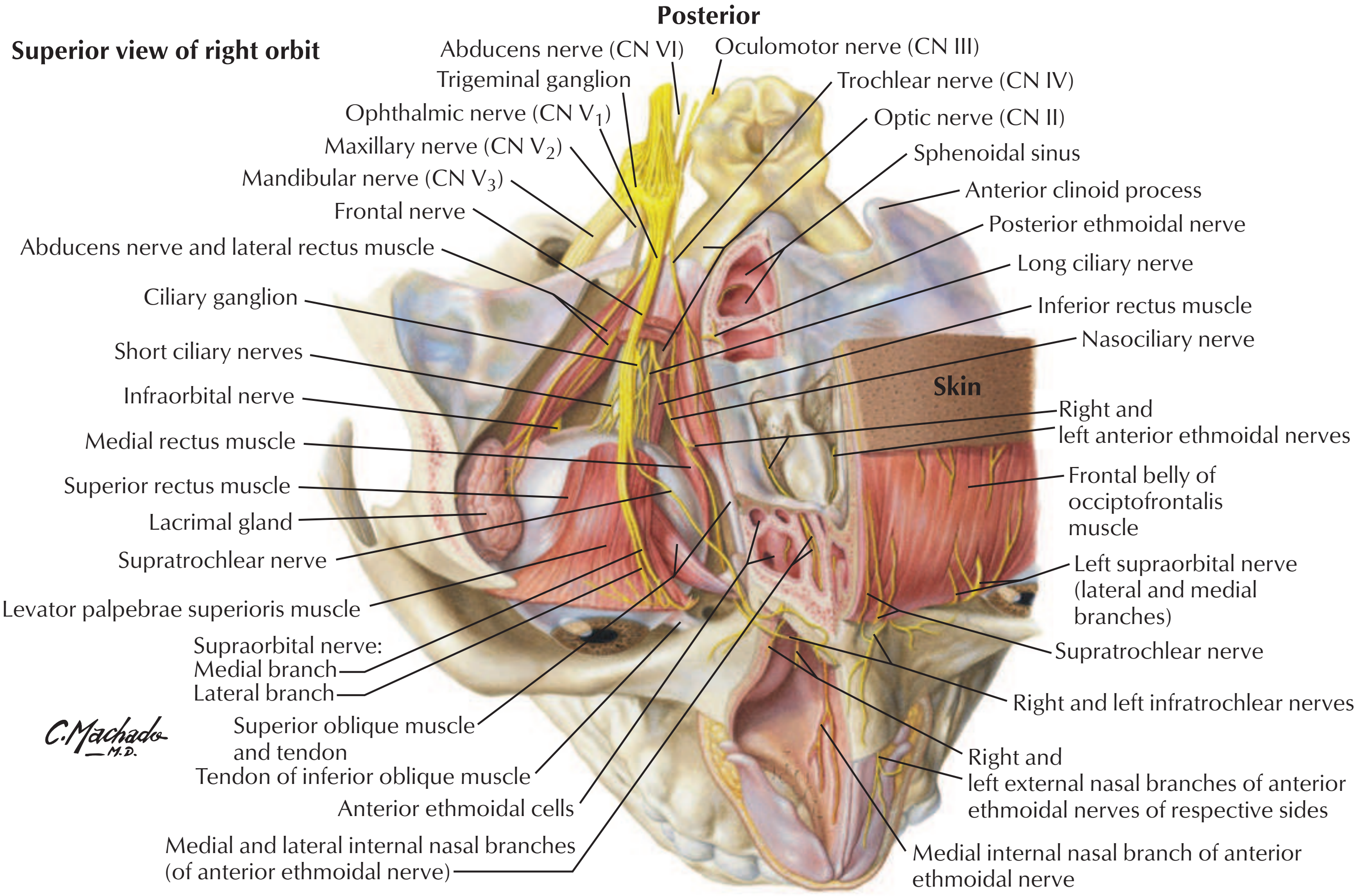
Supratrochlear nerve
Medial rectus muscle
Superior oblique muscle
Infratrochlear nerve
Nasociliary nerve
Trochlear nerve (CN IV)
Common tendinous ring (of Zinn)
Ophthalmic nerve (CN V_1)
Optic nerve (CN II)
Internal carotid artery and nerve plexus
Oculomotor nerve (CN III)
Trochlear nerve (CN IV)
Abducens nerve (CN VI)
Tentorium cerebelli
Medial branch
Lateral branch
Supraorbital nerve
Levator palpebrae superioris muscle
Superior rectus muscle
Lacrimal gland
Lacrimal nerve
Lateral rectus muscle
Frontal nerve
Maxillary nerve (CN V_2)
Meningeal branch of maxillary nerve
Mandibular nerve (CN V_3)
Lesser petrosal nerve
Meningeal branch of mandibular nerve
Greater petrosal nerve
Trigeminal (semilunar) ganglion
Tentorial (recurrent meningeal) branch of ophthalmic nerve



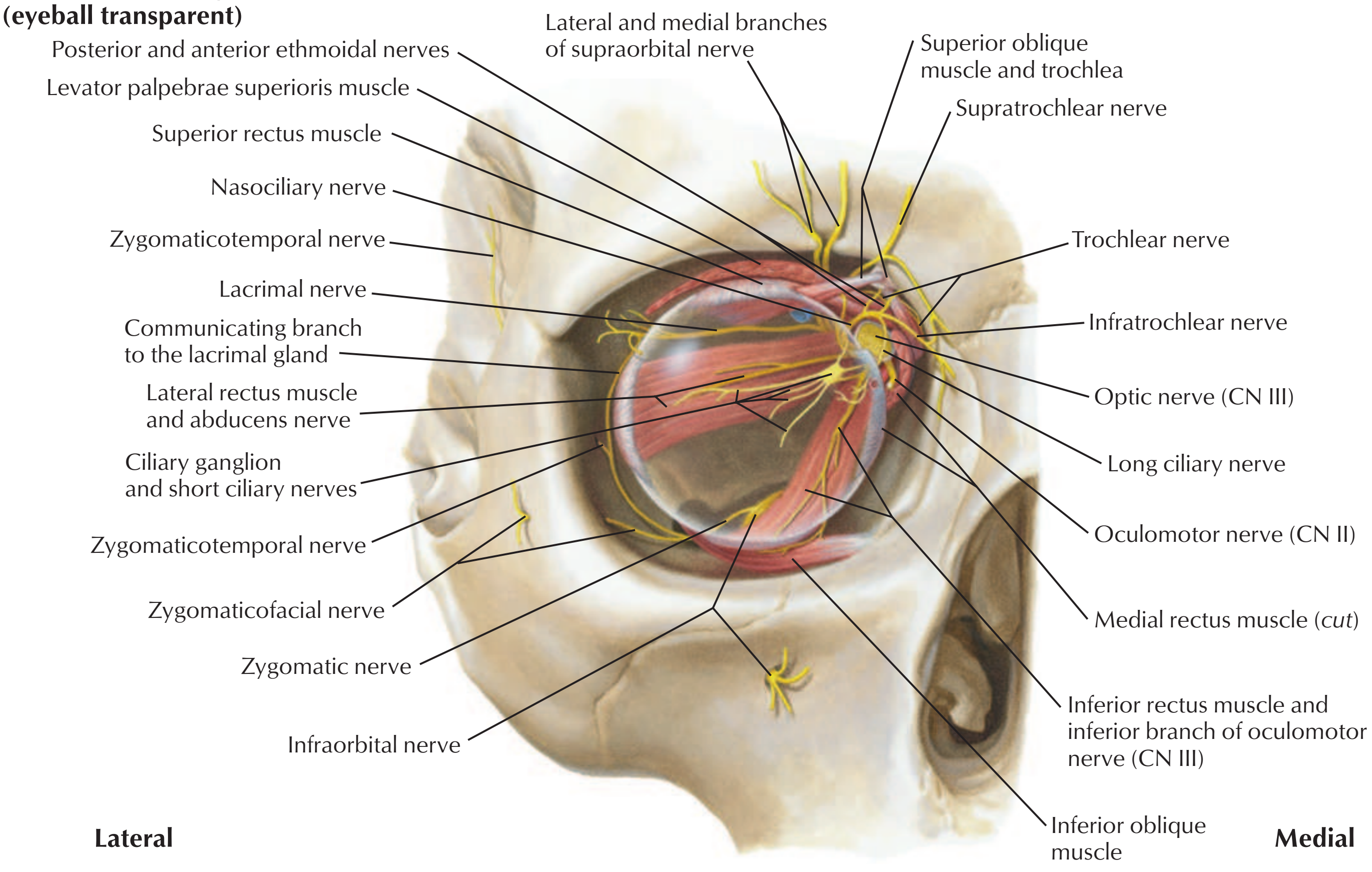
Superior view:
levator palpebrae superioris, superior rectus, and superior oblique muscles partially cut away

Supratrochlear nerve (*cut*)
Supraorbital nerve branches (*cut*)
Infratrochlear nerve
Anterior ethmoidal nerve
Meningeal sheath of optic nerve (CN II)
Posterior ethmoidal nerve
Superior branch of oculomotor nerve (CN III) (*cut*)
Nasociliary nerve
Internal carotid plexus
Trochlear nerve (CN IV) (*cut*)
Oculomotor nerve (CN III)
Abducens nerve (CN VI)
Long ciliary nerves
Short ciliary nerves
Lacrimal nerve
Ciliary ganglion
Parasympathetic root of ciliary ganglion (from inferior branch of oculomotor nerve)
Sympathetic root of ciliary ganglion (from internal carotid plexus)
Sensory root of ciliary ganglion (from nasociliary nerve)
Branches to inferior and medial rectus muscles
Abducens nerve (CN VI)
Inferior branch of oculomotor nerve (CN III)
Lacrimal nerve
Meningeal branch (CN V_2)
Frontal nerve (*cut*)
Ophthalmic nerve CN V_1)
Meningeal branch (CN V_3)

Superior view of right orbit

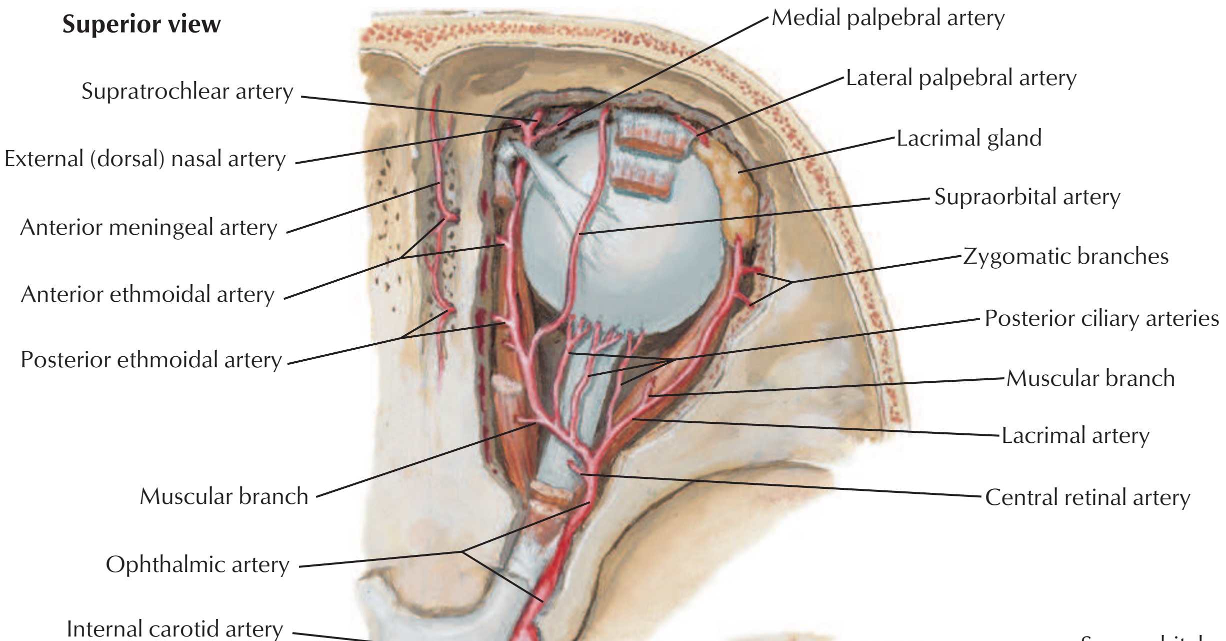

Posterior
Abducens nerve (CN VI)
Oculomotor nerve (CN III)
Trigeminal ganglion
Trochlear nerve (CN IV)
Ophthalmic nerve (CN V_1)
Optic nerve (CN II)
Maxillary nerve (CN V_2)
Sphenoidal sinus
Mandibular nerve (CN V_3)
Anterior clinoid process
Frontal nerve
Posterior ethmoidal nerve
Abducens nerve and lateral rectus muscle
Long ciliary nerve
Inferior rectus muscle
Ciliary ganglion
Nasociliary nerve
Short ciliary nerves
Skin
Infraorbital nerve
Right and left anterior ethmoidal nerves
Medial rectus muscle
Frontal belly of occiptofrontalis muscle
Superior rectus muscle
Lacrimal gland
Supratrochlear nerve
Left supraorbital nerve (lateral and medial branches)
Levator palpebrae superioris muscle
Supratrochlear nerve
Supraorbital nerve:
Medial branch
Lateral branch
Right and left infratrochlear nerves
C.Machado M.D.
Superior oblique muscle and tendon
Tendon of inferior oblique muscle
Right and left external nasal branches of anterior ethmoidal nerves of respective sides
Anterior ethmoidal cells
Medial and lateral internal nasal branches (of anterior ethmoidal nerve)
Medial internal nasal branch of anterior ethmoidal nerve

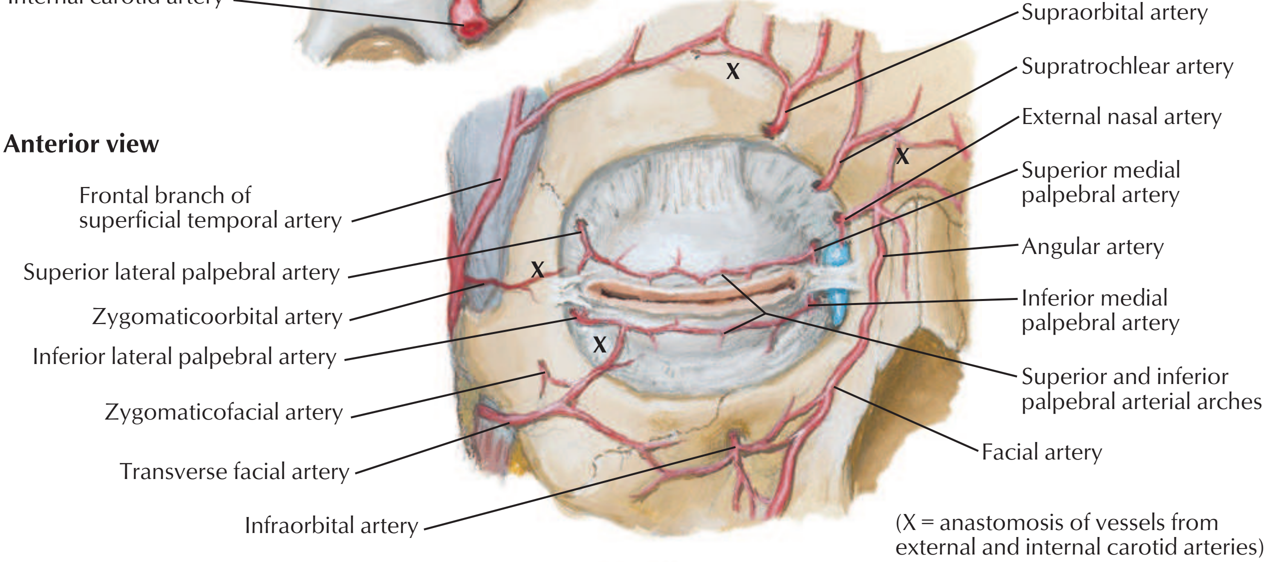
Anterior view of right orbit (eyeball transparent)


Anterior
Posterior and anterior ethmoidal nerves
Lateral and medial branches of supraorbital nerve
Superior oblique muscle and trochlea
Levator palpebrae superioris muscle
Supratrochlear nerve
Superior rectus muscle
Nasociliary nerve
Zygomaticotemporal nerve
Trochlear nerve
Lacrimal nerve
Infratrochlear nerve
Communicating branch to the lacrimal gland
Optic nerve (CN III)
Lateral rectus muscle and abducens nerve
Long ciliary nerve
Ciliary ganglion and short ciliary nerves
Oculomotor nerve (CN II)
Zygomaticotemporal nerve
Zygomaticofacial nerve
Medial rectus muscle (*cut*)
Zygomatic nerve
Inferior rectus muscle and inferior branch of oculomotor nerve (CN III)
Infraorbital nerve
Lateral
Inferior oblique muscle
Medial

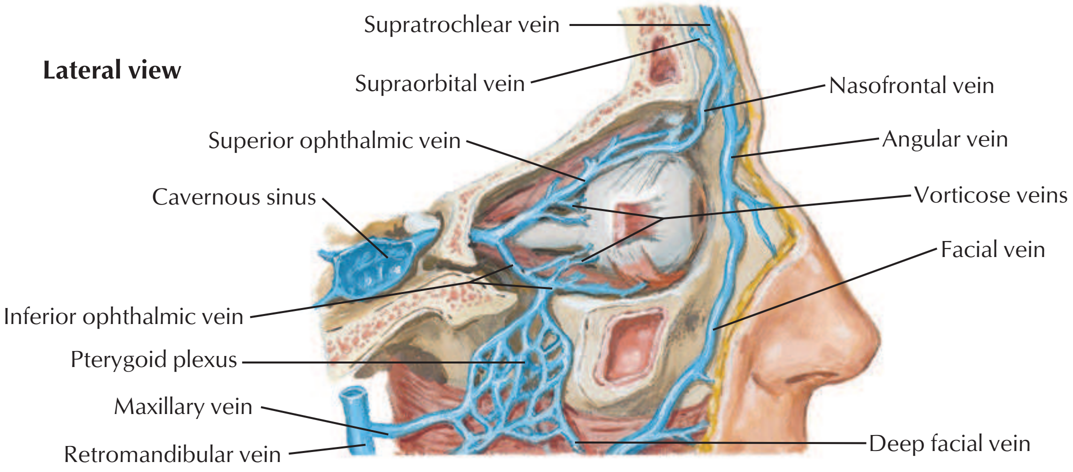
Arteries and Veins of Orbit and Eyelids

See also Plates 10, 84

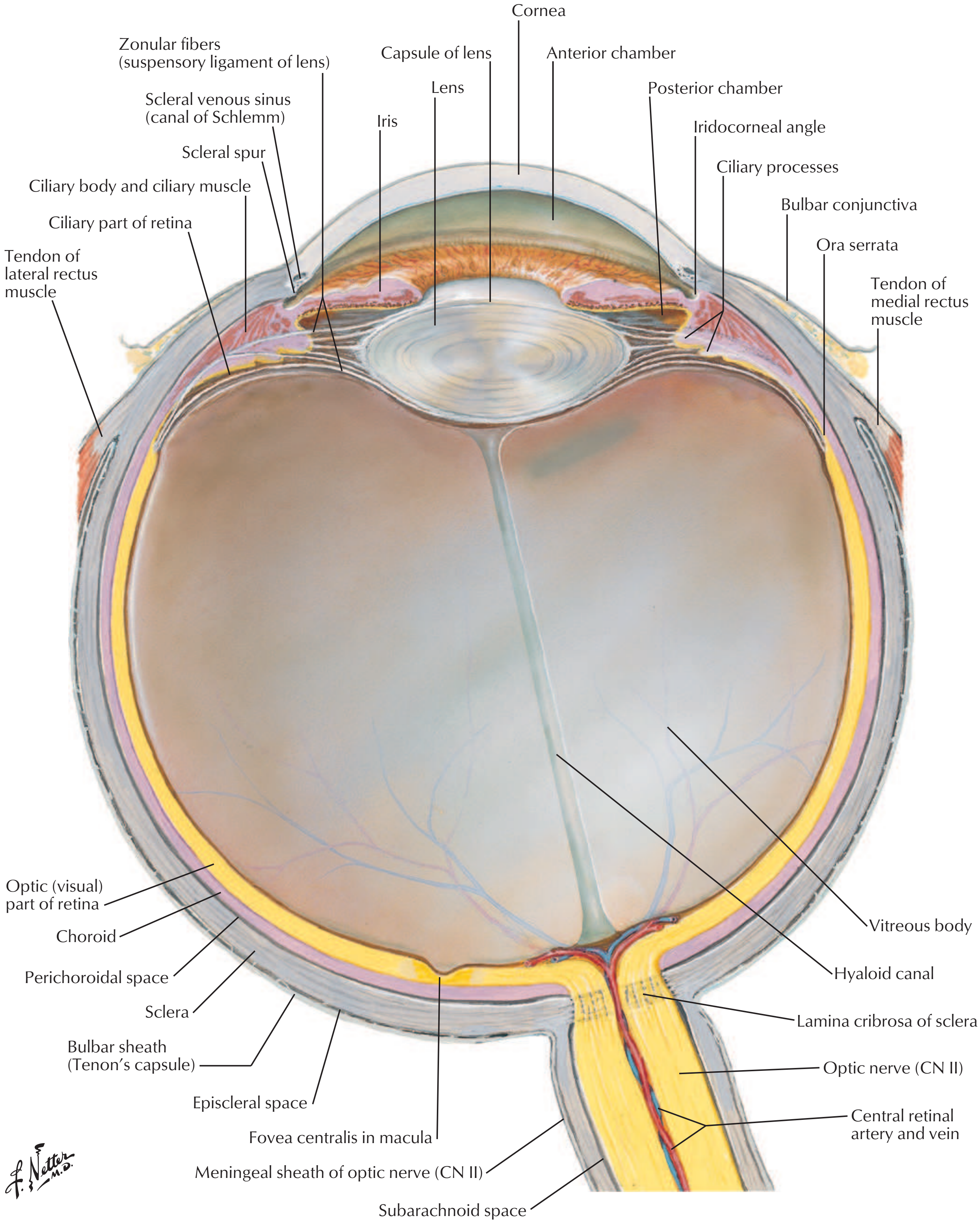

Superior view
Supratrochlear artery
External (dorsal) nasal artery
Anterior meningeal artery
Anterior ethmoidal artery
Posterior ethmoidal artery
Muscular branch
Ophthalmic artery
Internal carotid artery
Medial palpebral artery
Lateral palpebral artery
Lacrimal gland
Supraorbital artery
Zygomatic branches
Posterior ciliary arteries
Muscular branch
Lacrimal artery
Central retinal artery


Anterior view
Frontal branch of superficial temporal artery
Superior lateral palpebral artery
Zygomaticoorbital artery
Inferior lateral palpebral artery
Zygomaticofacial artery
Transverse facial artery
Infraorbital artery
Supraorbital artery
Supratrochlear artery
External nasal artery
Superior medial palpebral artery
Angular artery
Inferior medial palpebral artery
Superior and inferior palpebral arterial arches
Facial artery
X
X
X
X

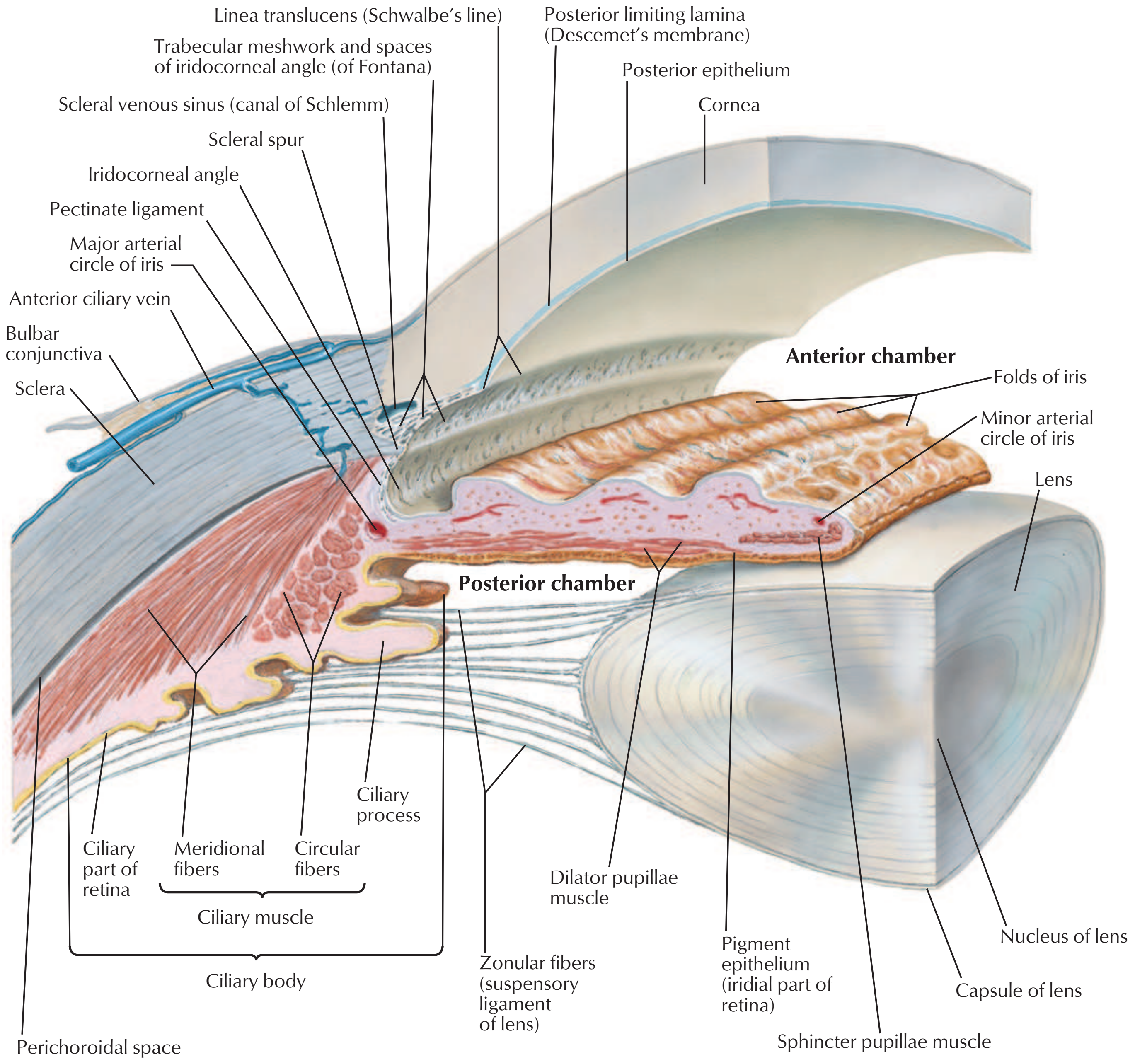
(X = anastomosis of vessels from external and internal carotid arteries)


Lateral view
Supratrochlear vein
Supraorbital vein
Superior ophthalmic vein
Cavernous sinus
Inferior ophthalmic vein
Pterygoid plexus
Maxillary vein
Retromandibular vein
Nasofrontal vein
Angular vein
Vorticose veins
Facial vein
Deep facial vein

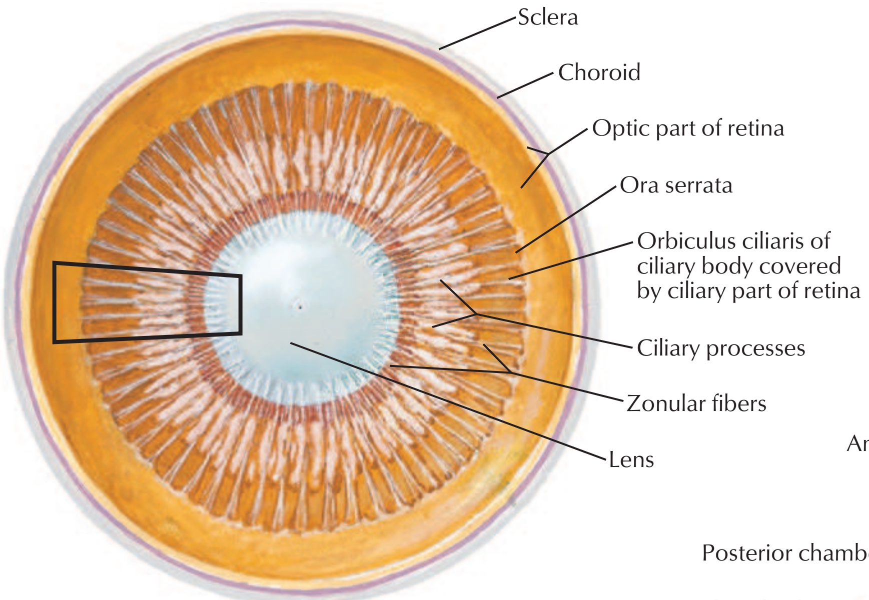
Eyeball: Transverse Section


Cornea
Zonular fibers (suspensory ligament of lens)
Capsule of lens
Anterior chamber
Lens
Posterior chamber
Scleral venous sinus (canal of Schlemm)
Iris
Iridocorneal angle
Scleral spur
Ciliary processes
Ciliary body and ciliary muscle
Bulbar conjunctiva
Ciliary part of retina
Ora serrata
Tendon of lateral rectus muscle
Tendon of medial rectus muscle
Optic (visual) part of retina
Choroid
Perichoroidal space
Sclera
Bulbar sheath (Tenon's capsule)
Episcleral space
Fovea centralis in macula
Meningeal sheath of optic nerve (CN II)
Subarachnoid space
Vitreous body
Hyaloid canal
Lamina cribrosa of sclera
Optic nerve (CN II)
Central retinal artery and vein
F. Netter M.D.

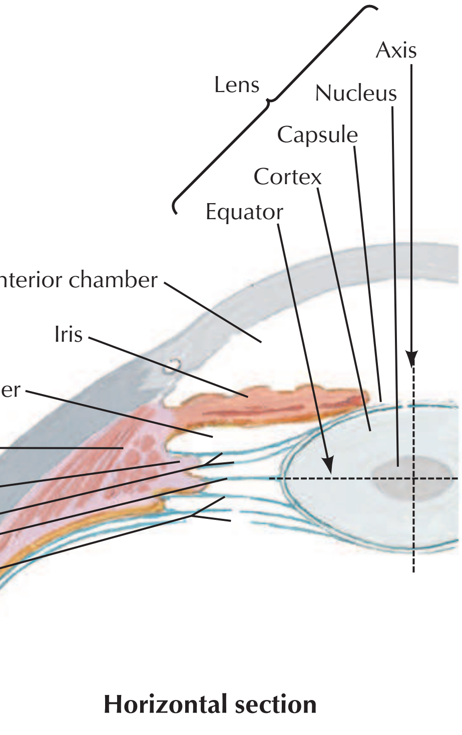
Anterior and Posterior Chambers of Eyeball


Linea translucens (Schwalbe's line)
Posterior limiting lamina (Descemet's membrane)
Trabecular meshwork and spaces of iridocorneal angle (of Fontana)
Posterior epithelium
Scleral venous sinus (canal of Schlemm)
Cornea
Scleral spur
Iridocorneal angle
Pectinate ligament
Major arterial circle of iris
Anterior ciliary vein
Bulbar conjunctiva
Sclera
Anterior chamber
Folds of iris
Minor arterial circle of iris
Lens
Posterior chamber
Ciliary process
Ciliary part of retina
Meridional fibers
Circular fibers
Ciliary muscle
Ciliary body
Dilator pupillae muscle
Zonular fibers (suspensory ligament of lens)
Pigment epithelium (iridial part of retina)
Nucleus of lens
Capsule of lens
Sphincter pupillae muscle
Perichoroidal space

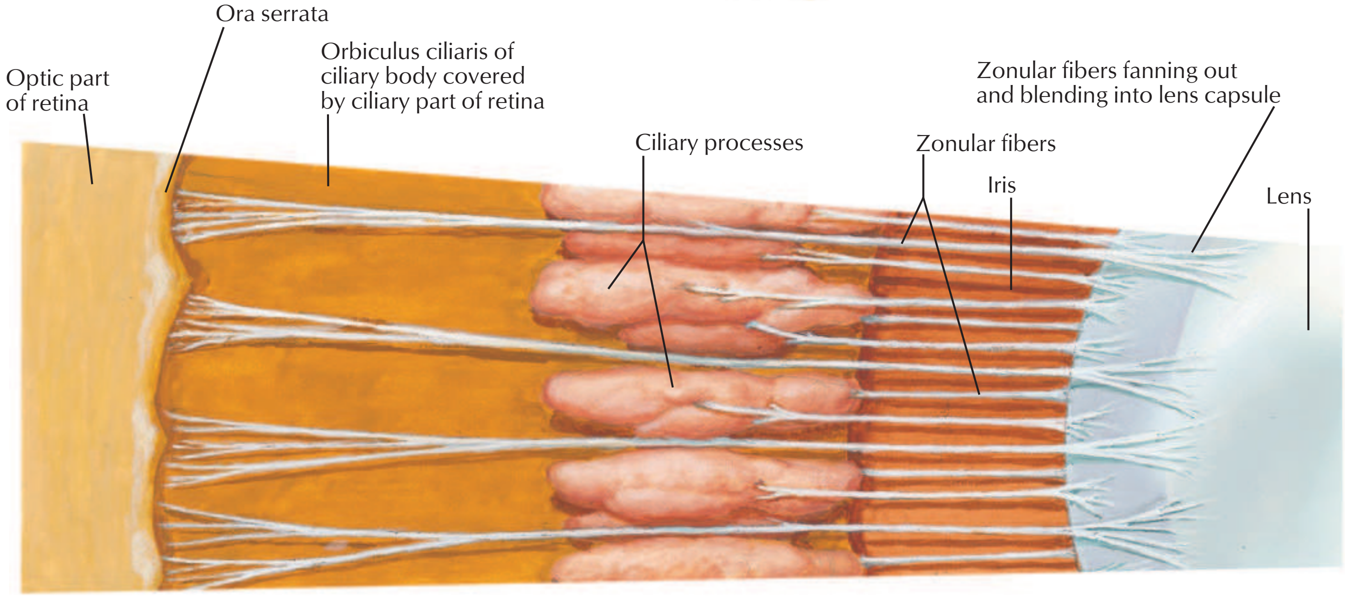
Note: For clarity, only single plane of zonular fibers shown; actually, fibers surround entire circumference of lens.


Sclera
Choroid
Optic part of retina
Ora serrata
Orbiculus ciliaris of ciliary body covered by ciliary part of retina
Ciliary processes
Zonular fibers
Lens

Eyeball sectioned in coronal plane: anterior segment viewed from behind


Lens
Axis
Nucleus
Capsule
Cortex
Equator
Anterior chamber
Iris
Posterior chamber
Ciliary body
Ciliary process
Zonular fibers
Preequatorial
Equatorial
Postequatorial
Orbiculus ciliaris of ciliary body
Ora serrata
Optic part of retina

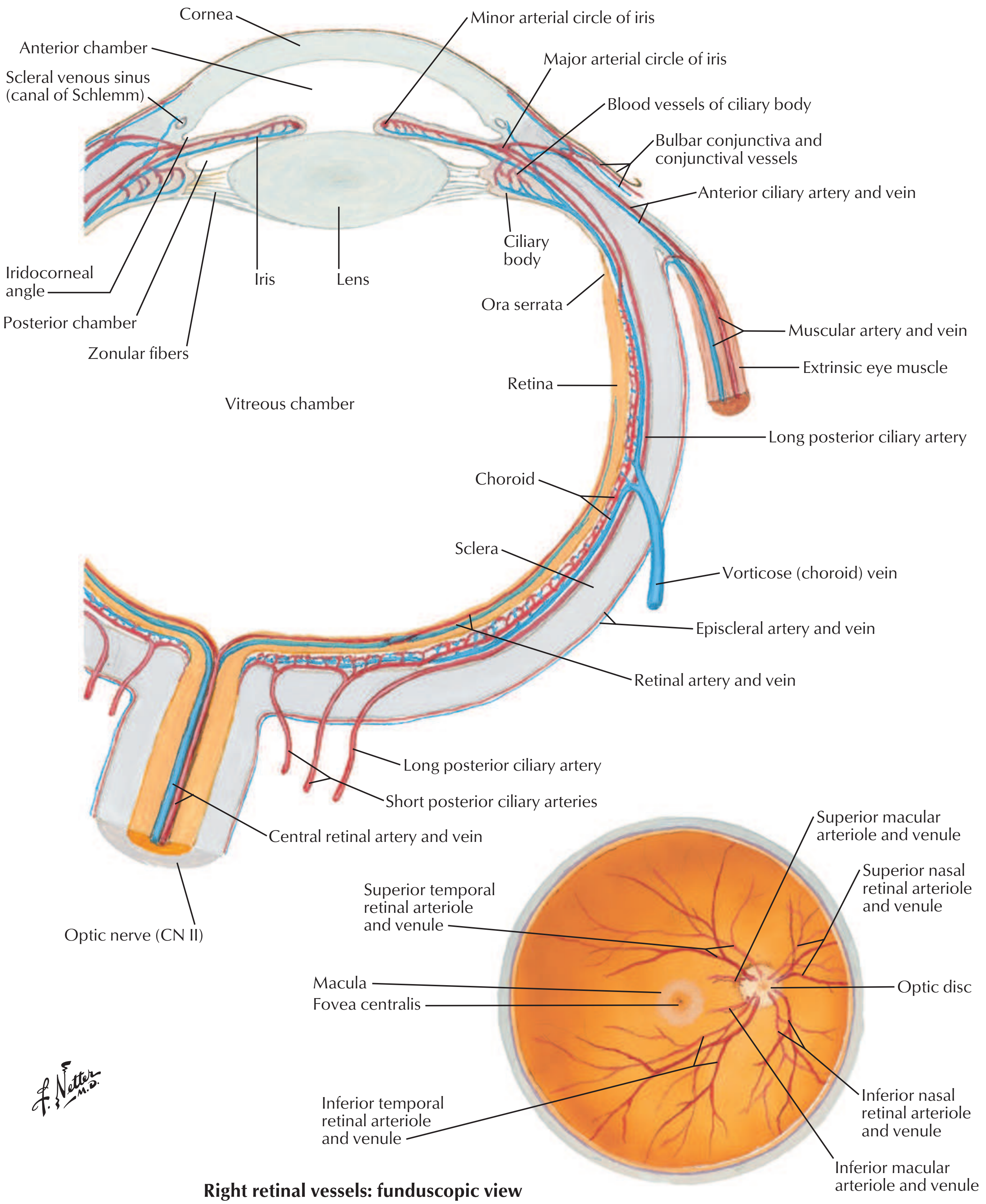
Horizontal section


Ora serrata
Optic part of retina
Orbiculus ciliaris of ciliary body covered by ciliary part of retina
Ciliary processes
Zonular fibers fanning out and blending into lens capsule
Zonular fibers
Iris
Lens

Enlargement of segment outlined in top illustration (semischematic)

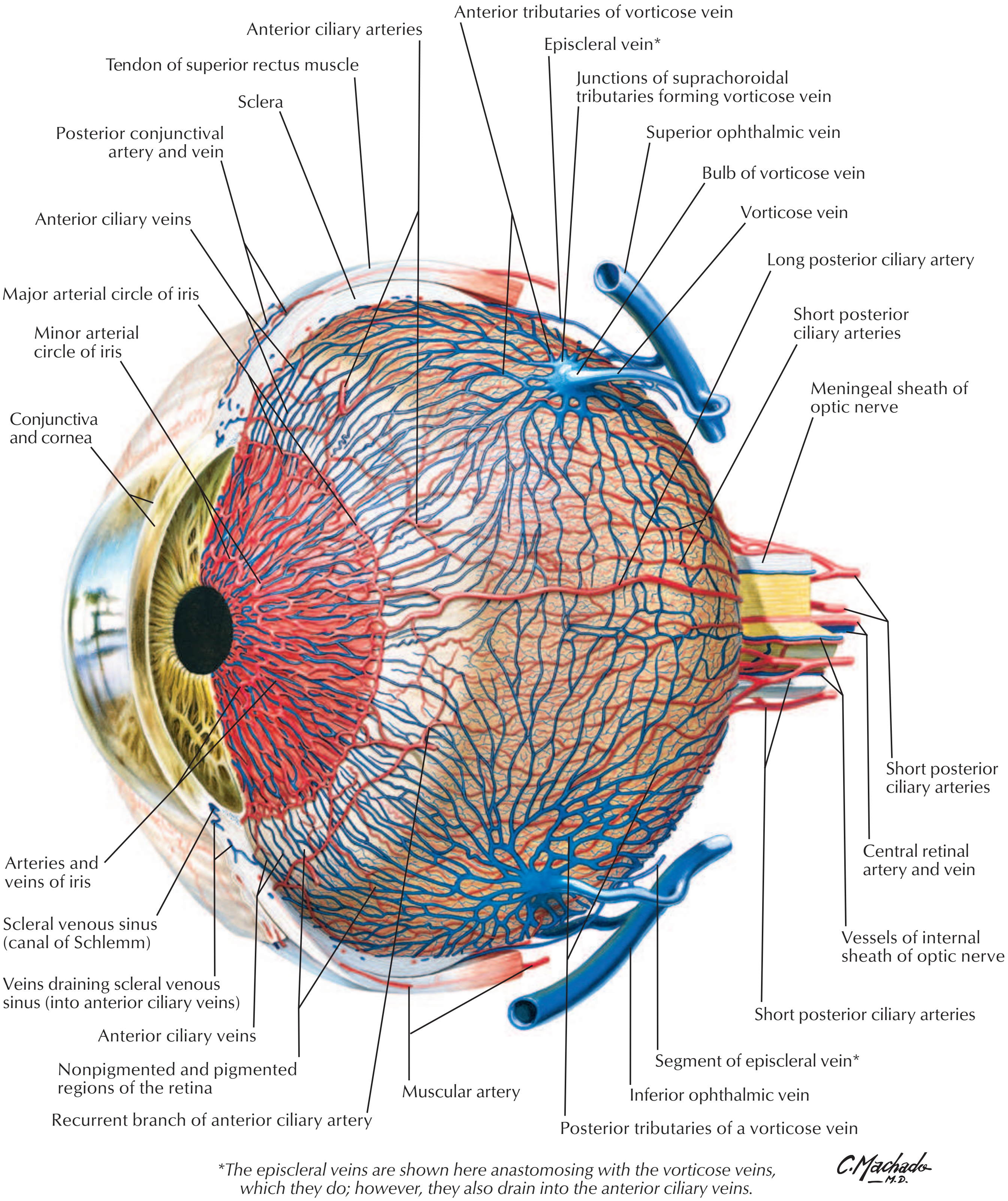
Intrinsic Arteries and Veins of Eye

See also **Plate 104**

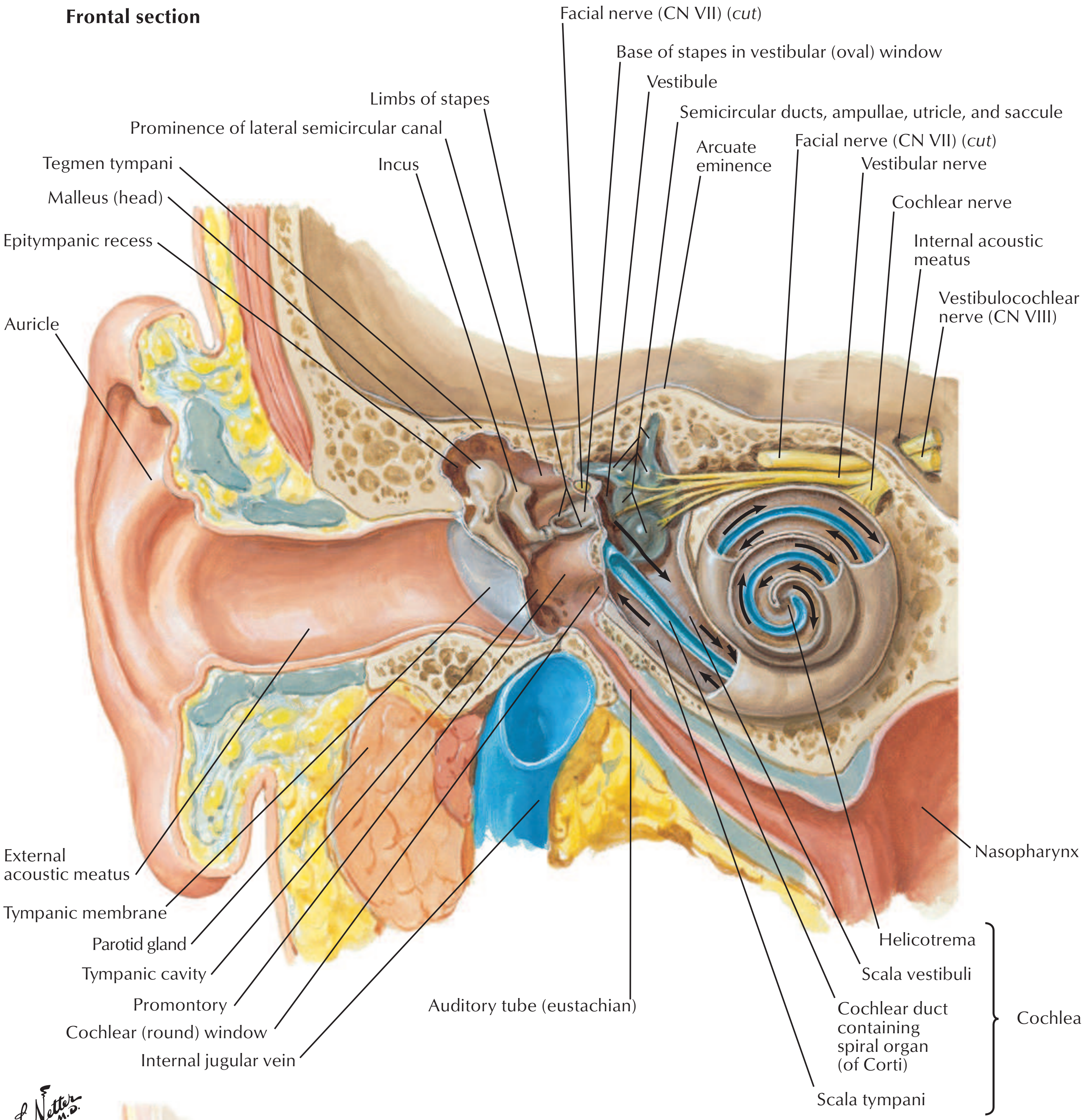

Cornea
Anterior chamber
Scleral venous sinus (canal of Schlemm)
Minor arterial circle of iris
Major arterial circle of iris
Blood vessels of ciliary body
Bulbar conjunctiva and conjunctival vessels
Anterior ciliary artery and vein
Iridocorneal angle
Iris
Lens
Ciliary body
Ora serrata
Posterior chamber
Zonular fibers
Muscular artery and vein
Extrinsic eye muscle
Retina
Vitreous chamber
Long posterior ciliary artery
Choroid
Sclera
Vorticose (choroid) vein
Episcleral artery and vein
Retinal artery and vein
Long posterior ciliary artery
Short posterior ciliary arteries
Central retinal artery and vein
Optic nerve (CN II)
Superior macular arteriole and venule
Superior nasal retinal arteriole and venule
Superior temporal retinal arteriole and venule
Macula
Fovea centralis
Optic disc
Inferior temporal retinal arteriole and venule
Inferior nasal retinal arteriole and venule
Inferior macular arteriole and venule

Right retinal vessels: funduscopic view

Vascular arrangements within the choroid (vascular tunic) of the eyeball

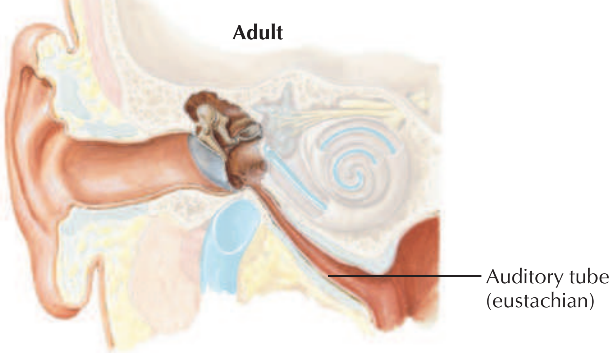

Anterior tributaries of vorticose vein
Anterior ciliary arteries
Episcleral vein*
Tendon of superior rectus muscle
Junctions of suprachoroidal tributaries forming vorticose vein
Sclera
Superior ophthalmic vein
Posterior conjunctival artery and vein
Bulb of vorticose vein
Vorticose vein
Anterior ciliary veins
Long posterior ciliary artery
Major arterial circle of iris
Short posterior ciliary arteries
Minor arterial circle of iris
Meningeal sheath of optic nerve
Conjunctiva and cornea
Short posterior ciliary arteries
Central retinal artery and vein
Arteries and veins of iris
Scleral venous sinus (canal of Schlemm)
Vessels of internal sheath of optic nerve
Veins draining scleral venous sinus (into anterior ciliary veins)
Short posterior ciliary arteries
Anterior ciliary veins
Segment of episcleral vein*
Nonpigmented and pigmented regions of the retina
Muscular artery
Inferior ophthalmic vein
Recurrent branch of anterior ciliary artery
Posterior tributaries of a vorticose vein
C.Machado M.D.

The episcleral veins are shown here anastomosing with the vorticose veins, which they do; however, they also drain into the anterior ciliary veins.



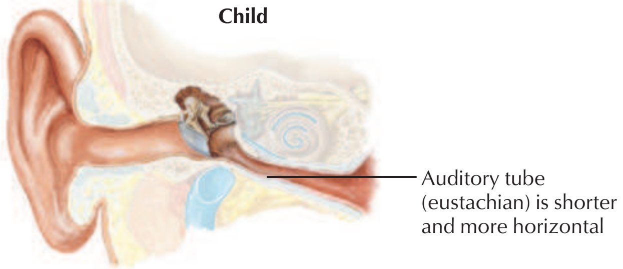
Frontal section

Facial nerve (CN VII) (*cut*)
Base of stapes in vestibular (oval) window
Vestibule
Limbs of stapes
Semicircular ducts, ampullae, utricle, and saccule
Prominence of lateral semicircular canal
Arcuate eminence
Facial nerve (CN VII) (*cut*)
Tegmen tympani
Incus
Vestibular nerve
Malleus (head)
Cochlear nerve
Epitympanic recess
Internal acoustic meatus
Vestibulocochlear nerve (CN VIII)
Auricle
External acoustic meatus
Nasopharynx
Tympanic membrane
Helicotrema
Parotid gland
Tympanic cavity
Scala vestibuli
Promontory
Auditory tube (eustachian)
Cochlear duct containing spiral organ (of Corti)
Cochlea
Cochlear (round) window
Internal jugular vein
Scala tympani



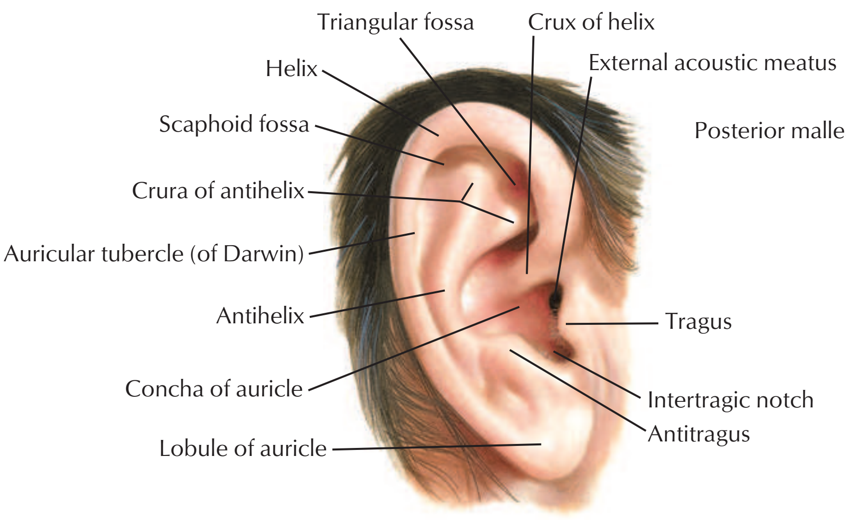
Adult

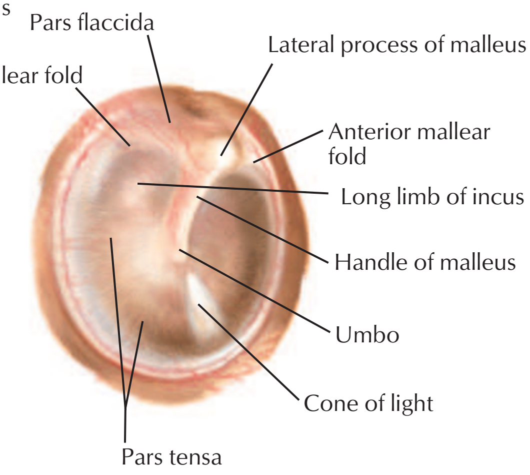
Auditory tube (eustachian)

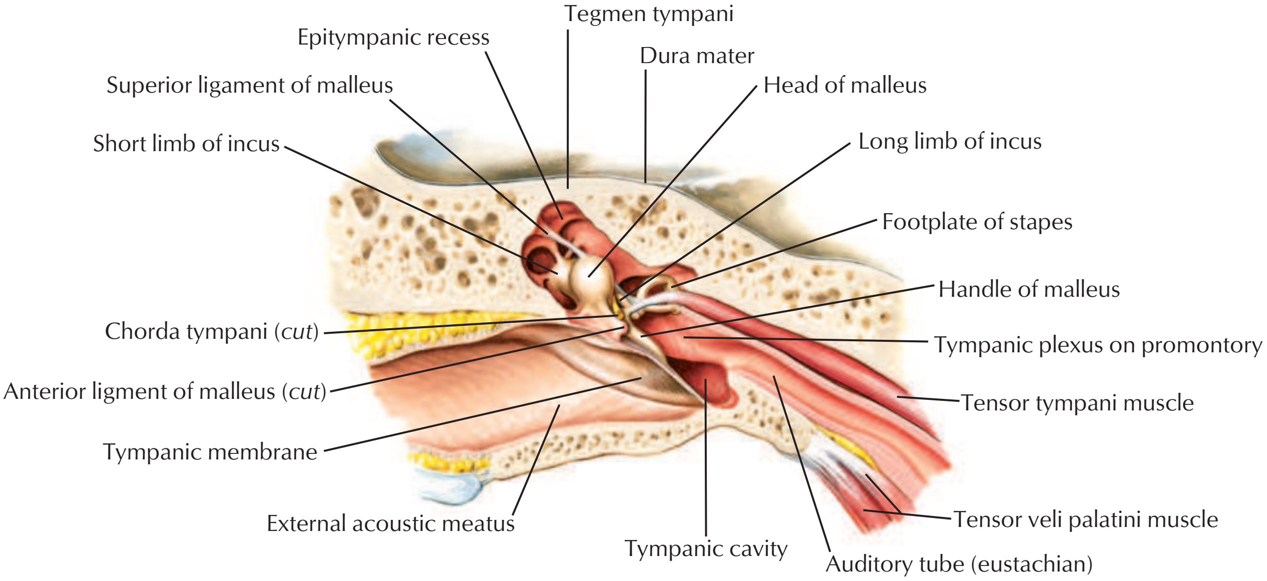


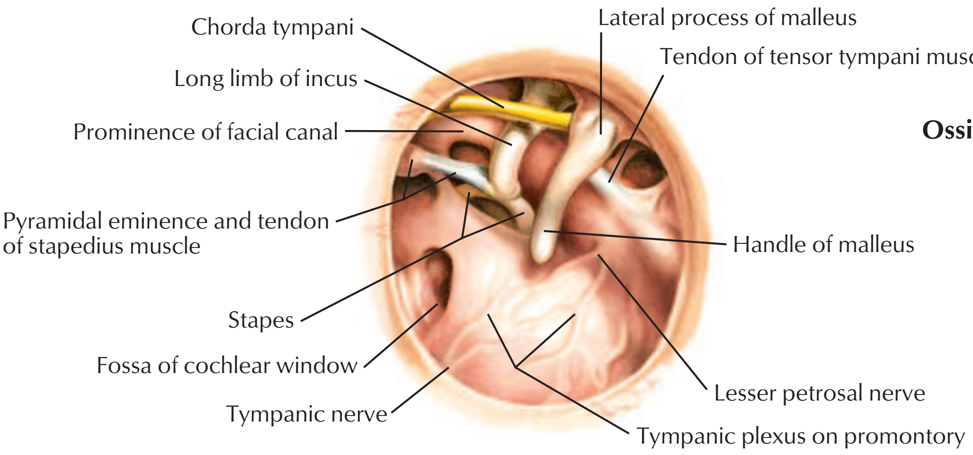
Child

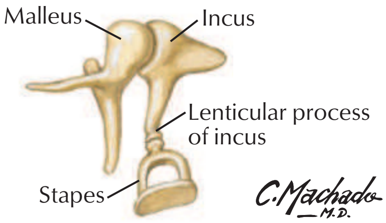
Auditory tube (eustachian) is shorter and more horizontal


Right auricle (pinna)
Triangular fossa
Crux of helix
Helix
External acoustic meatus
Scaphoid fossa
Crura of antihelix
Auricular tubercle (of Darwin)
Antihelix
Tragus
Concha of auricle
Intertragic notch
Antitragus
Lobule of auricle


Otoscopic view of right tympanic membrane
Pars flaccida
Lateral process of malleus
Posterior mallear fold
Anterior mallear fold
Long limb of incus
Handle of malleus
Umbo
Cone of light
Pars tensa

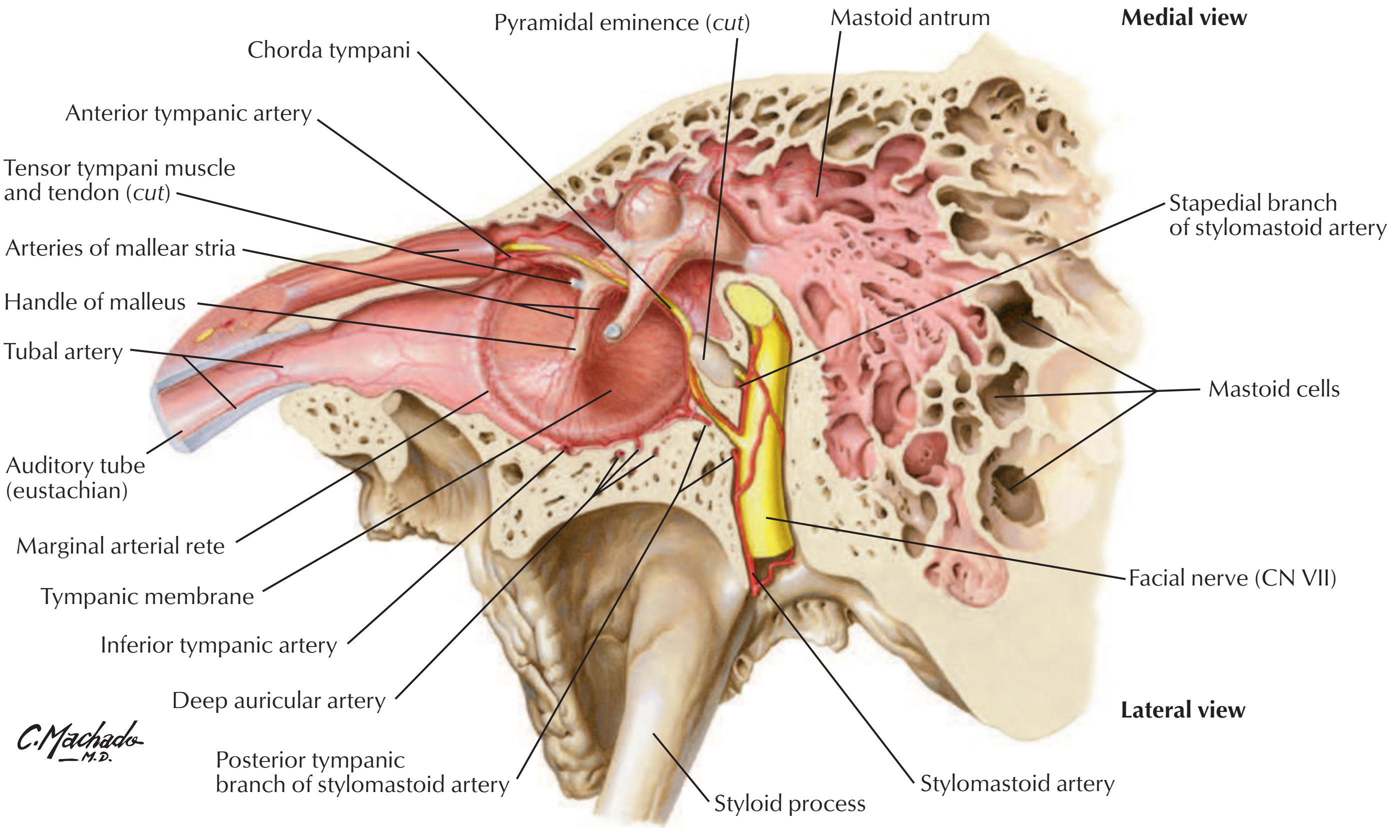

Coronal oblique section of external acoustic meatus and middle ear (tympanic cavity)
Tegmen tympani
Epitympanic recess
Dura mater
Superior ligament of malleus
Head of malleus
Short limb of incus
Long limb of incus
Footplate of stapes
Handle of malleus
Chorda tympani (cut)
Tympanic plexus on promontory
Anterior ligment of malleus (cut)
Tensor tympani muscle
Tympanic membrane
Tensor veli palatini muscle
External acoustic meatus
Tympanic cavity
Auditory tube (eustachian)

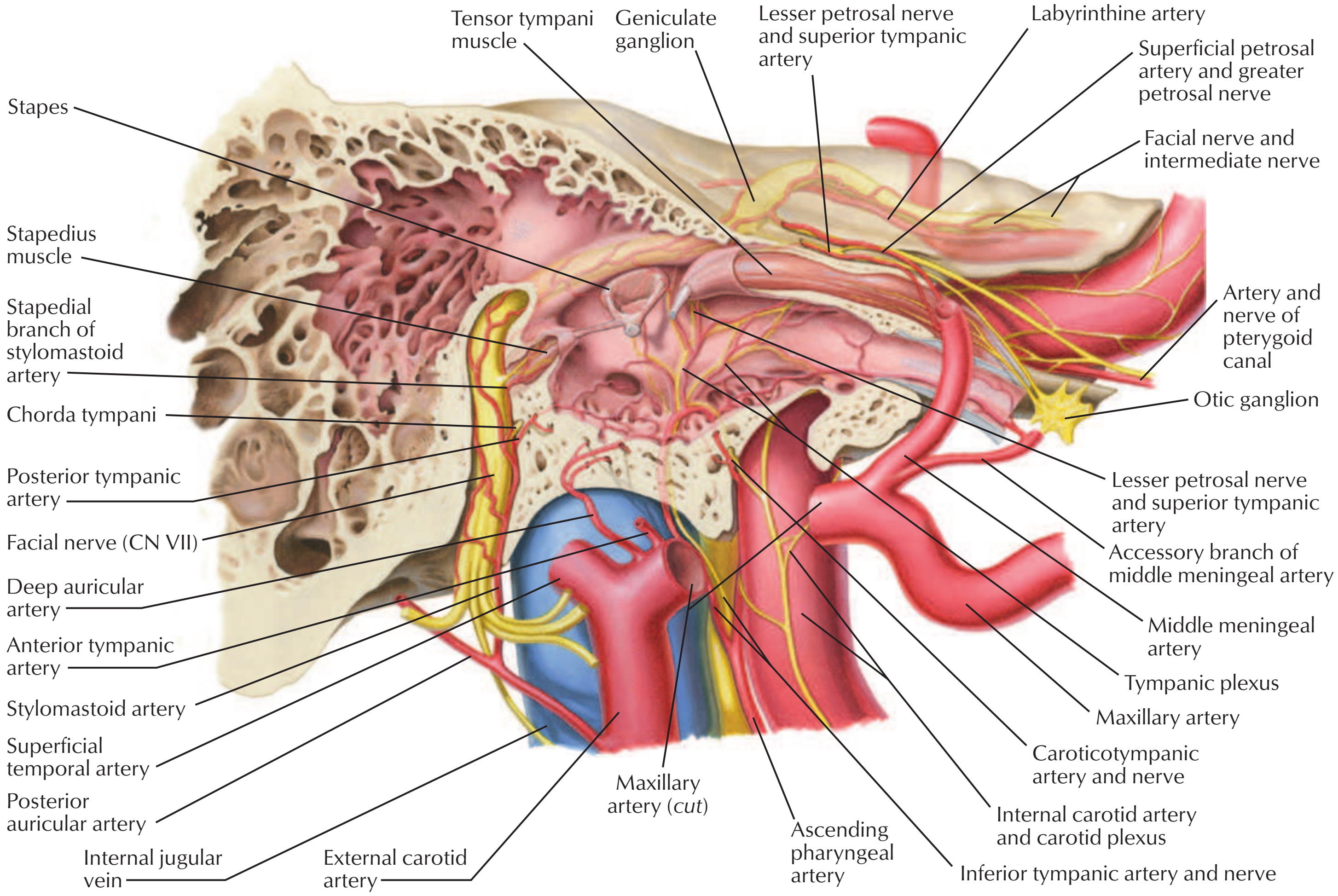

Right tympanic cavity after removal of tympanic membrane (lateral view)
Lateral process of malleus
Chorda tympani
Tendon of tensor tympani muscle
Long limb of incus
Prominence of facial canal
Pyramidal eminence and tendon of stapedius muscle
Handle of malleus
Stapes
Fossa of cochlear window
Lesser petrosal nerve
Tympanic nerve
Tympanic plexus on promontory


Ossicles articulated: medial view
Malleus
Incus
Lenticular process of incus
Stapes

Tympanic Cavity

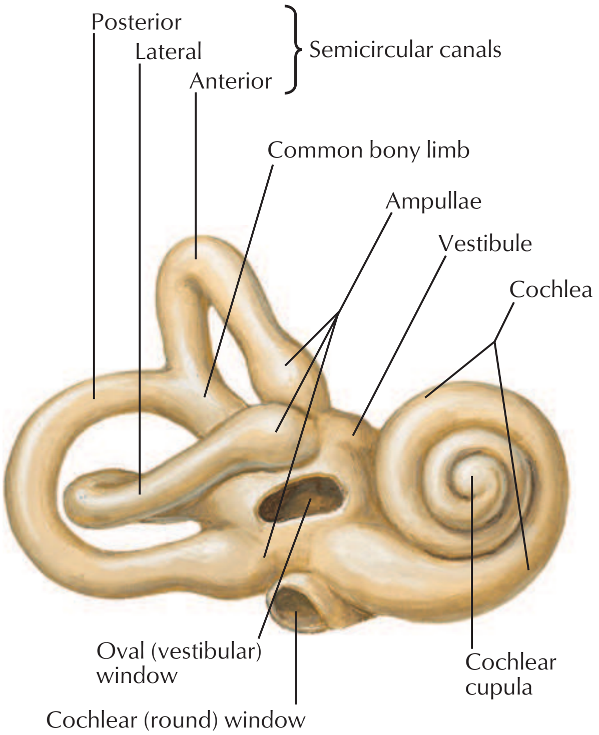
See also Plates 59, 146


Medial view
Lateral view
Chorda tympani
Anterior tympanic artery
Tensor tympani muscle and tendon (*cut*)
Arteries of mallear stria
Handle of malleus
Tubal artery
Auditory tube (eustachian)
Marginal arterial rete
Tympanic membrane
Inferior tympanic artery
Deep auricular artery
Posterior tympanic branch of stylomastoid artery
Pyramidal eminence (*cut*)
Mastoid antrum
Stapedial branch of stylomastoid artery
Mastoid cells
Facial nerve (CN VII)
Stylomastoid artery
Styloid process

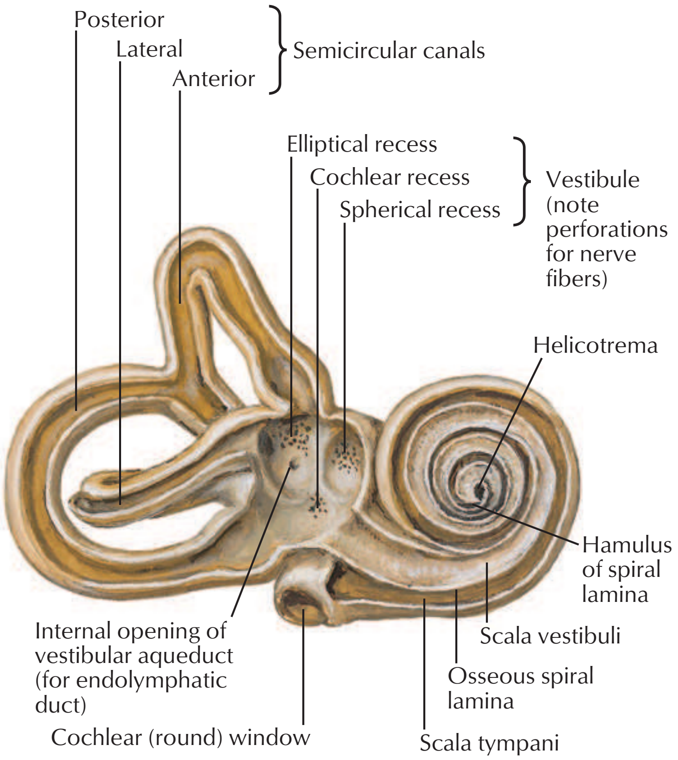

Tensor tympani muscle
Geniculate ganglion
Lesser petrosal nerve and superior tympanic artery
Labyrinthine artery
Superficial petrosal artery and greater petrosal nerve
Facial nerve and intermediate nerve
Stapes
Stapedius muscle
Stapedial branch of stylomastoid artery
Chorda tympani
Posterior tympanic artery
Facial nerve (CN VII)
Deep auricular artery
Anterior tympanic artery
Stylomastoid artery
Superficial temporal artery
Posterior auricular artery
Internal jugular vein
External carotid artery
Maxillary artery (*cut*)
Ascending pharyngeal artery
Artery and nerve of pterygoid canal
Otic ganglion
Lesser petrosal nerve and superior tympanic artery
Accessory branch of middle meningeal artery
Middle meningeal artery
Tympanic plexus
Maxillary artery
Caroticotympanic artery and nerve
Internal carotid artery and carotid plexus
Inferior tympanic artery and nerve

See also Plate 135

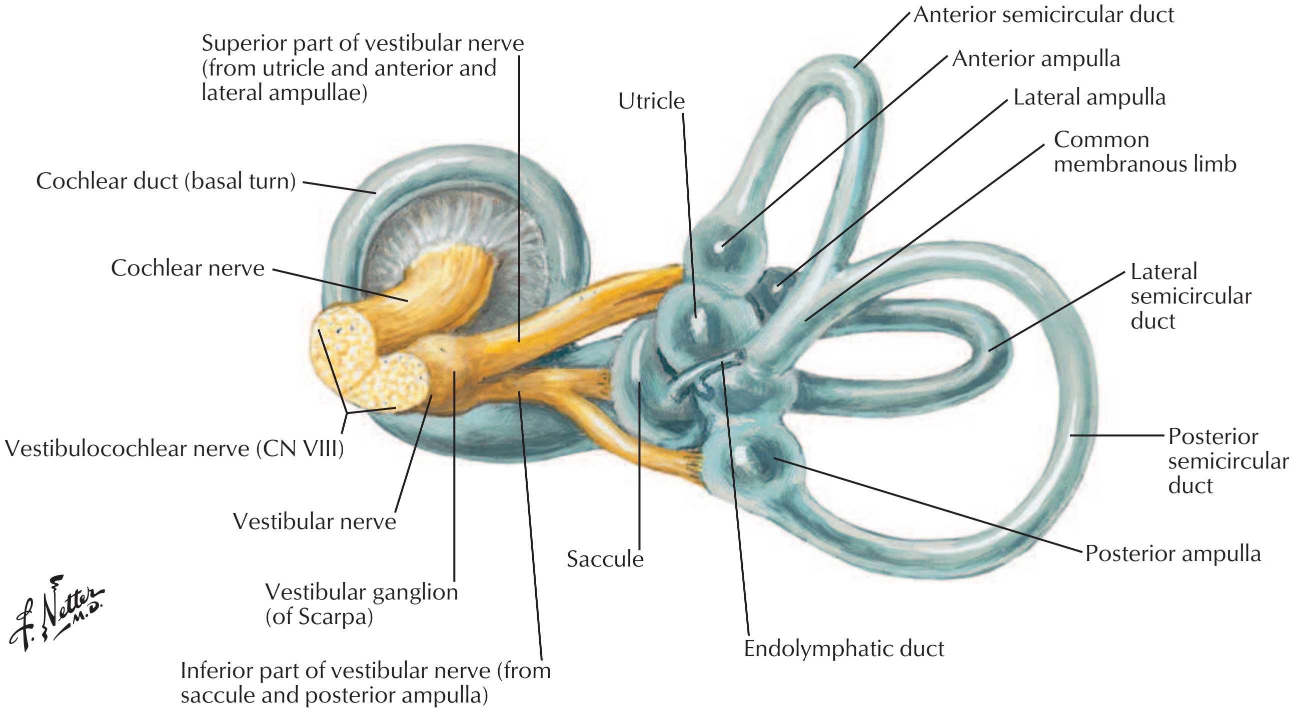
Right bony labyrinth (otic capsule), anterolateral view: surrounding cancellous bone removed


Posterior
Lateral
Anterior
Semicircular canals
Common bony limb
Ampullae
Vestibule
Cochlea
Oval (vestibular) window
Cochlear cupula
Cochlear (round) window

Dissected right bony labyrinth (otic capsule): membranous labyrinth removed


Posterior
Lateral
Anterior
Semicircular canals
Elliptical recess
Cochlear recess
Spherical recess
Vestibule (note perforations for nerve fibers)
Helicotrema
Hamulus of spiral lamina
Scala vestibuli
Osseous spiral lamina
Internal opening of vestibular aqueduct (for endolymphatic duct)
Cochlear (round) window
Scala tympani

Right membranous labyrinth with nerves: medial view


Anterior semicircular duct
Superior part of vestibular nerve (from utricle and anterior and lateral ampullae)
Anterior ampulla
Lateral ampulla
Utricle
Common membranous limb
Cochlear duct (basal turn)
Cochlear nerve
Lateral semicircular duct
Posterior semicircular duct
Vestibulocochlear nerve (CN VIII)
Vestibular nerve
Posterior ampulla
Saccule
Vestibular ganglion (of Scarpa)
Endolymphatic duct
Inferior part of vestibular nerve (from saccule and posterior ampulla)

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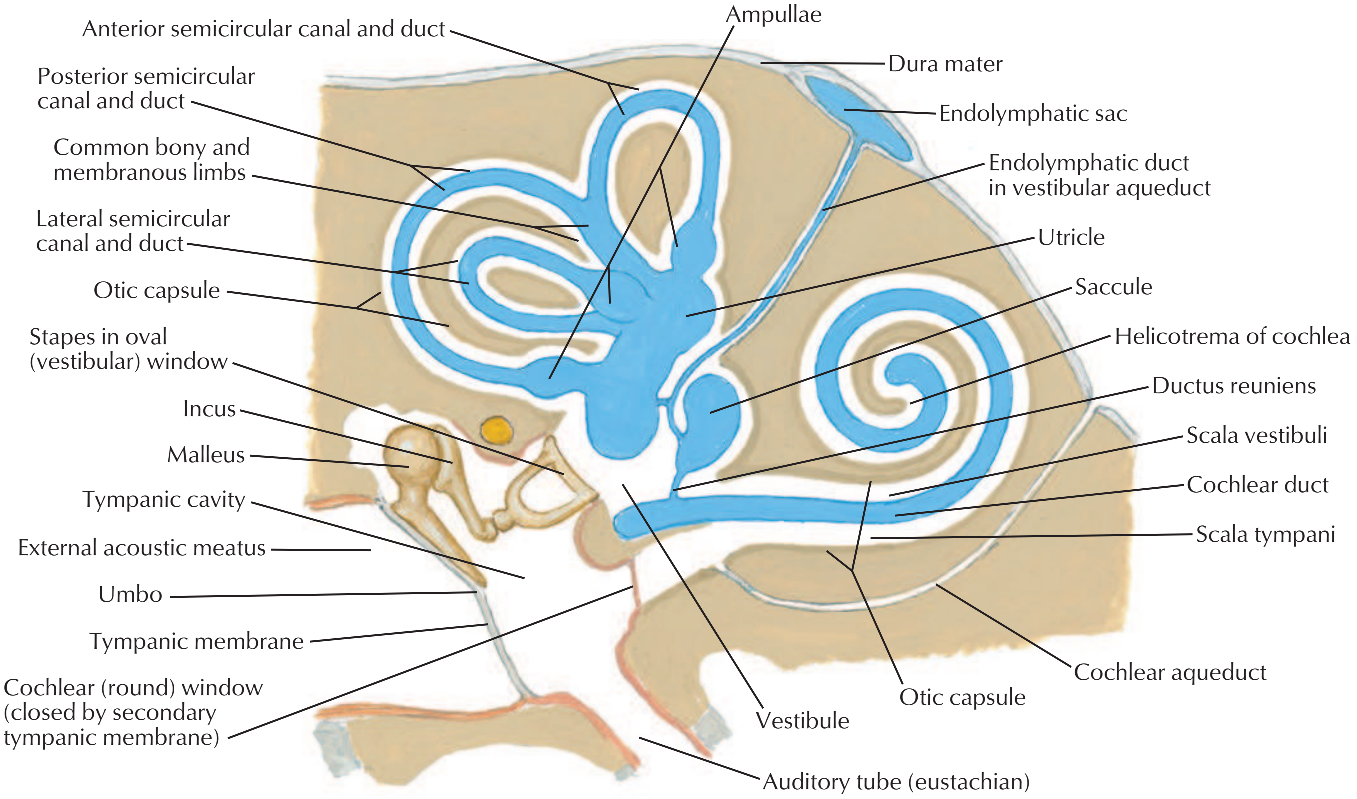
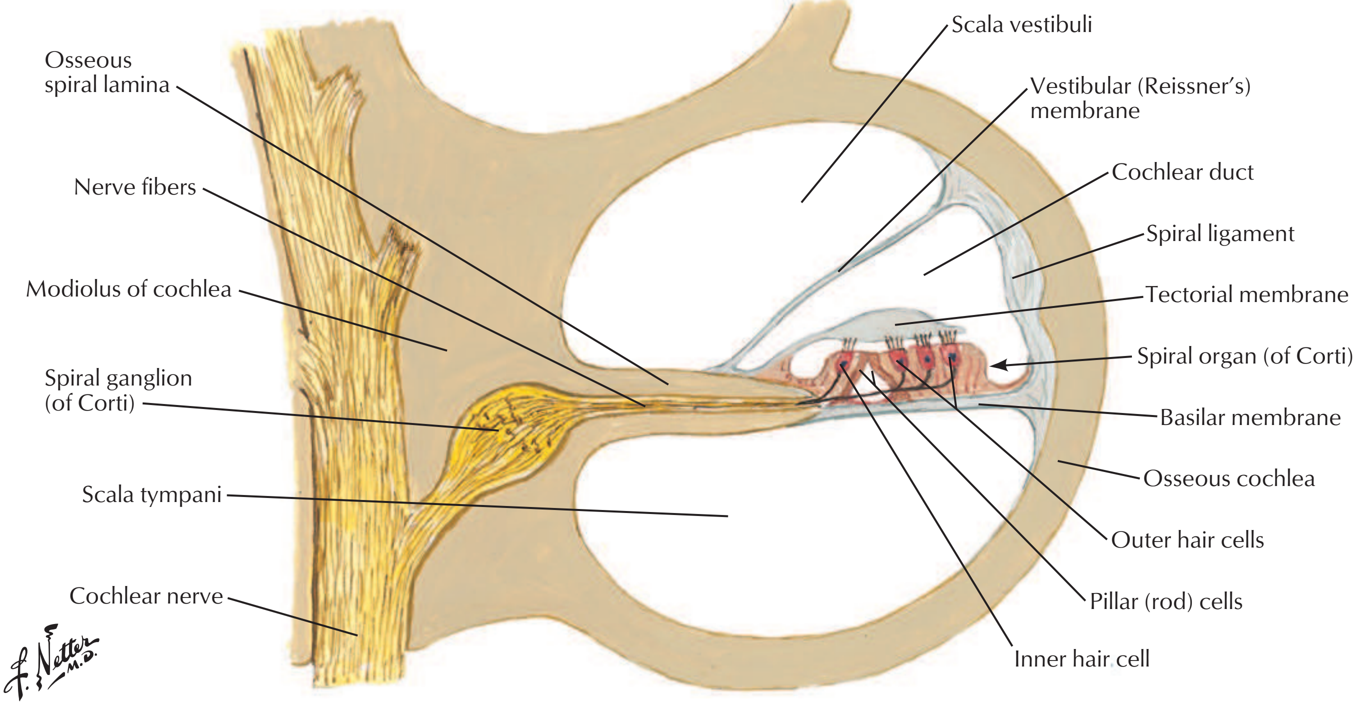
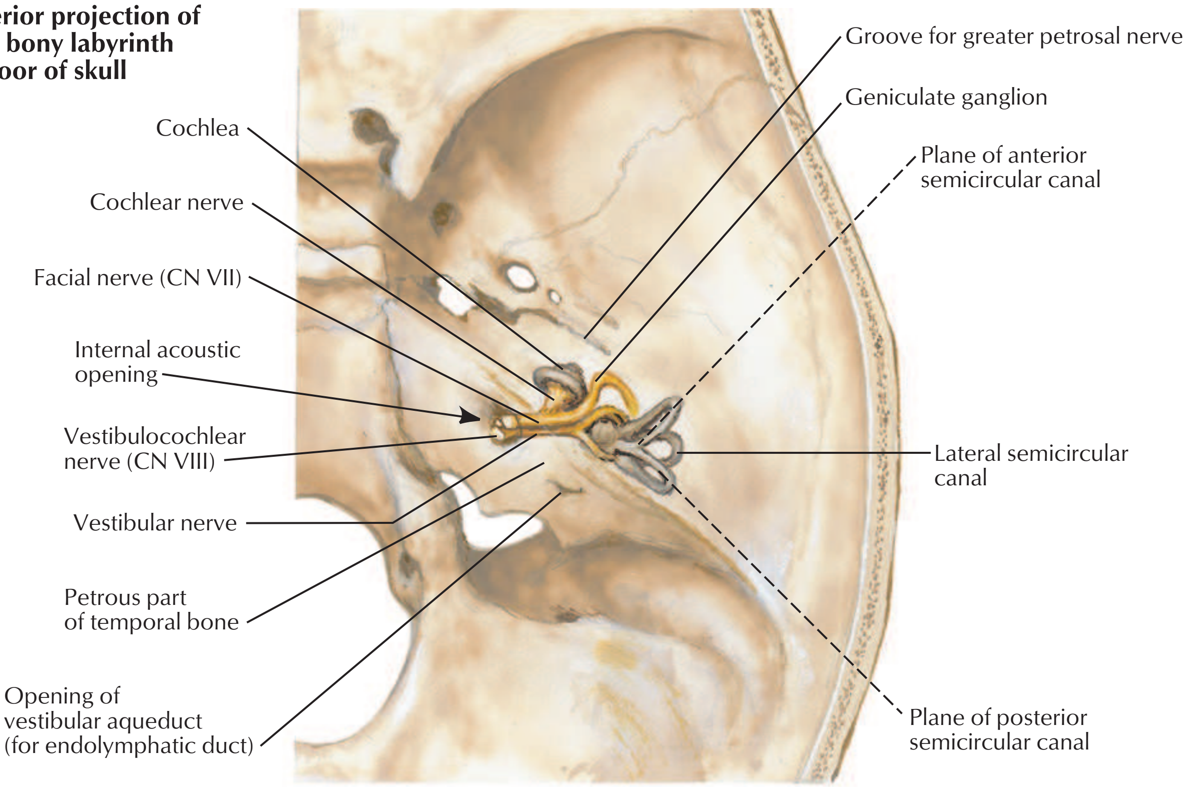
Bony and membranous labyrinths: schema


Anterior semicircular canal and duct
Ampullae
Dura mater
Posterior semicircular canal and duct
Endolymphatic sac
Common bony and membranous limbs
Endolymphatic duct in vestibular aqueduct
Lateral semicircular canal and duct
Utricle
Otic capsule
Saccule
Stapes in oval (vestibular) window
Helicotrema of cochlea
Ductus reuniens
Incus
Scala vestibuli
Malleus
Cochlear duct
Tympanic cavity
Scala tympani
External acoustic meatus
Umbo
Tympanic membrane
Cochlear aqueduct
Cochlear (round) window (closed by secondary tympanic membrane)
Otic capsule
Vestibule
Auditory tube (eustachian)

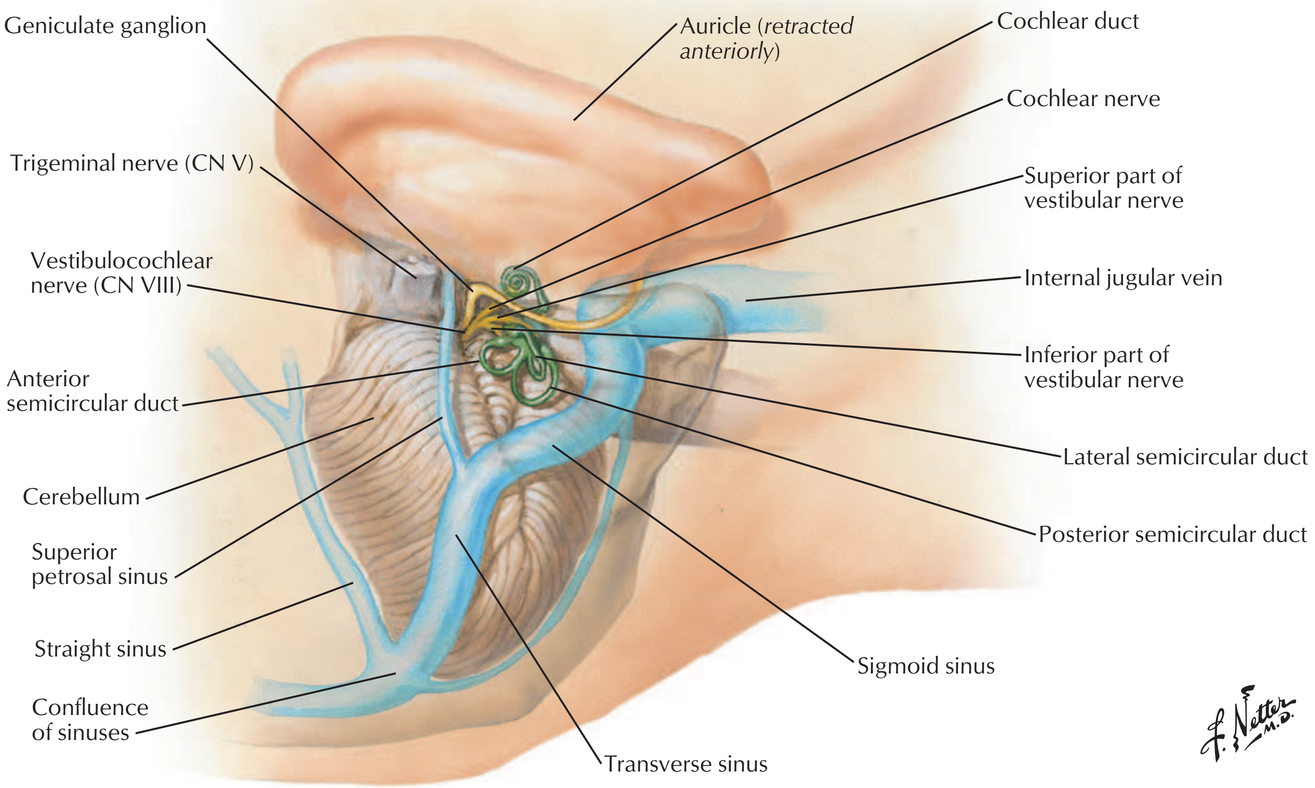
Section through turn of cochlea


Scala vestibuli
Osseous spiral lamina
Vestibular (Reissner's) membrane
Cochlear duct
Nerve fibers
Spiral ligament
Modiolus of cochlea
Tectorial membrane
Spiral organ (of Corti)
Spiral ganglion (of Corti)
Basilar membrane
Scala tympani
Osseous cochlea
Outer hair cells
Pillar (rod) cells
Cochlear nerve
Inner hair cell

Superior projection of right bony labyrinth on floor of skull


Cochlea
Cochlear nerve
Facial nerve (CN VII)
Internal acoustic opening
Vestibulocochlear nerve (CN VIII)
Vestibular nerve
Petrous part of temporal bone
Opening of vestibular aqueduct (for endolymphatic duct)
Groove for greater petrosal nerve
Geniculate ganglion
Plane of anterior semicircular canal
Lateral semicircular canal
Plane of posterior semicircular canal

Lateral projection of right membranous labyrinth


Geniculate ganglion
Trigeminal nerve (CN V)
Vestibulocochlear nerve (CN VIII)
Anterior semicircular duct
Cerebellum
Superior petrosal sinus
Straight sinus
Confluence of sinuses
Transverse sinus
Sigmoid sinus
Auricle (*retracted anteriorly*)
Cochlear duct
Cochlear nerve
Superior part of vestibular nerve
Internal jugular vein
Inferior part of vestibular nerve
Lateral semicircular duct
Posterior semicircular duct
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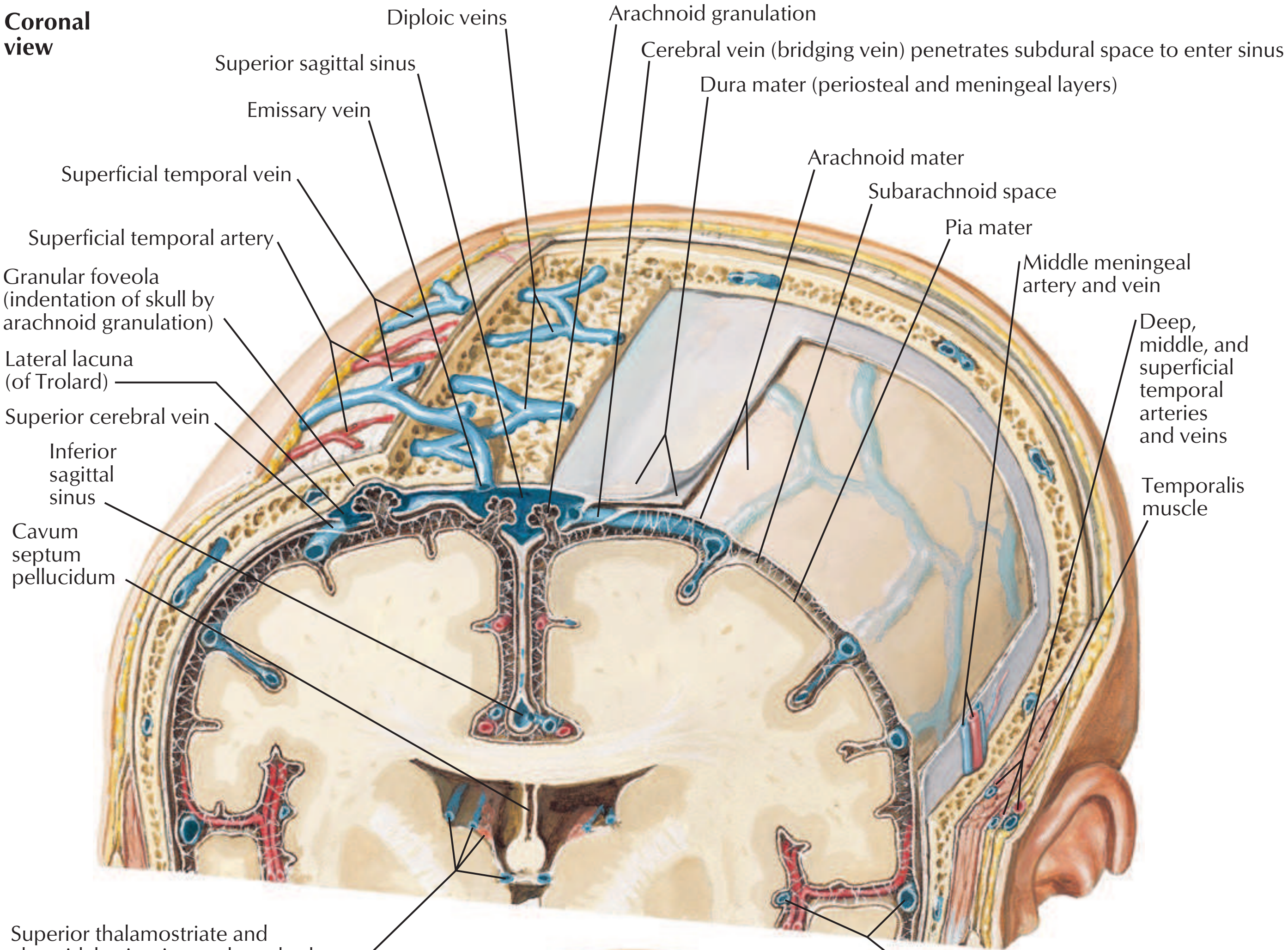
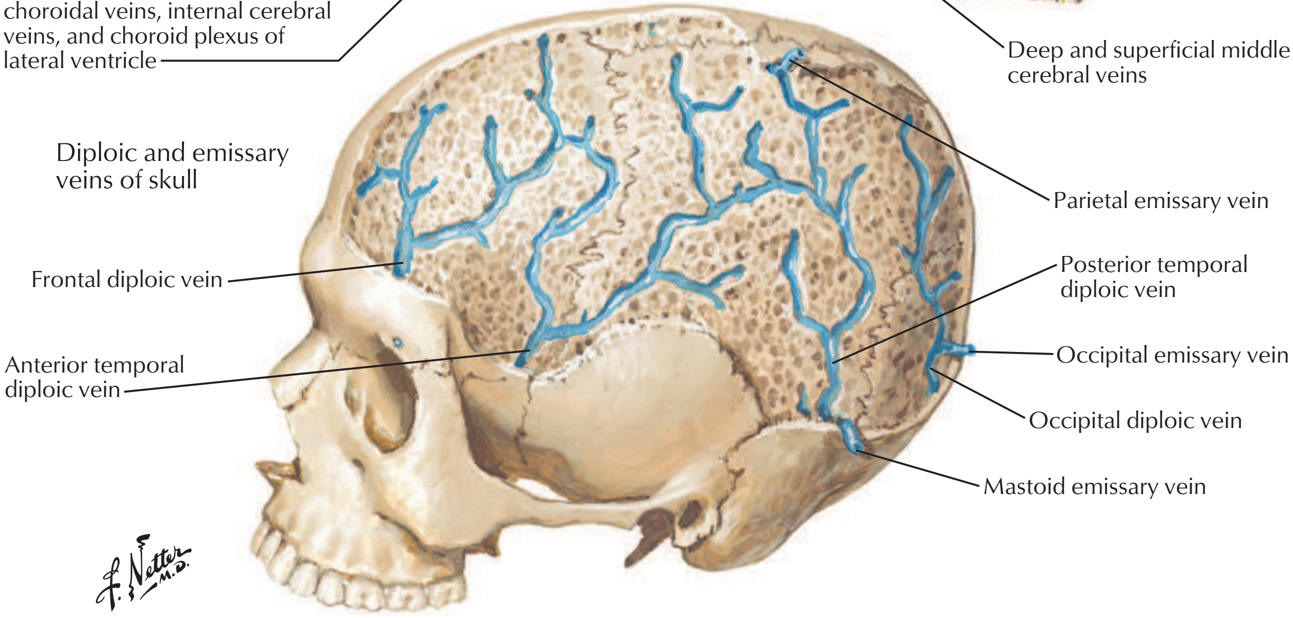
Meninges and Diploic Veins

See also **Plate 10**

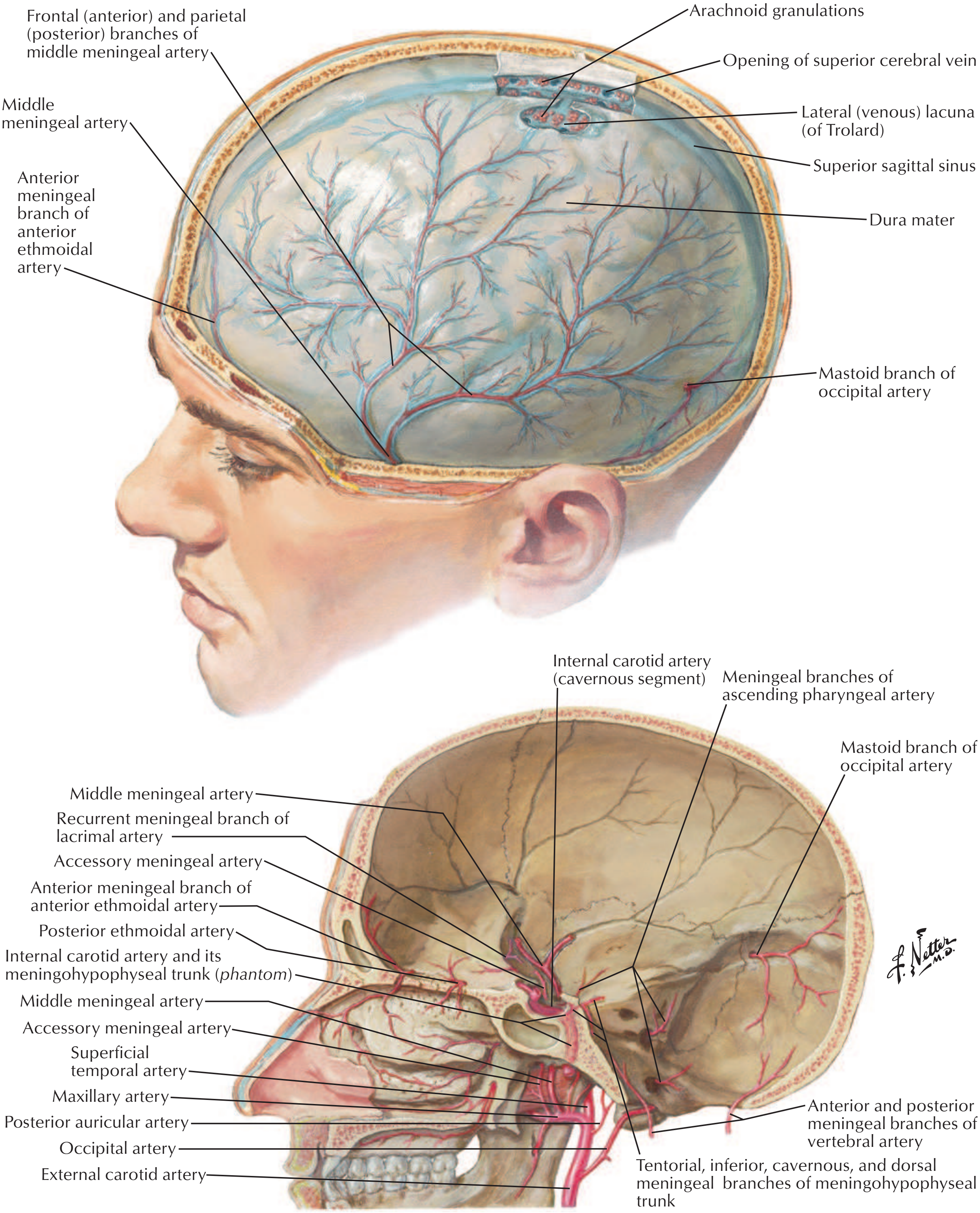

Coronal view

Diploic veins
Arachnoid granulation
Superior sagittal sinus
Cerebral vein (bridging vein) penetrates subdural space to enter sinus
Dura mater (periosteal and meningeal layers)
Emissary vein
Superficial temporal vein
Arachnoid mater
Subarachnoid space
Superficial temporal artery
Pia mater
Granular foveola (indentation of skull by arachnoid granulation)
Middle meningeal artery and vein
Lateral lacuna (of Trolard)
Deep, middle, and superficial temporal arteries and veins
Superior cerebral vein
Inferior sagittal sinus
Temporalis muscle
Cavum septum pellucidum
Superior thalamostriate and choroidal veins, internal cerebral veins, and choroid plexus of lateral ventricle
Deep and superficial middle cerebral veins


Diploic and emissary veins of skull

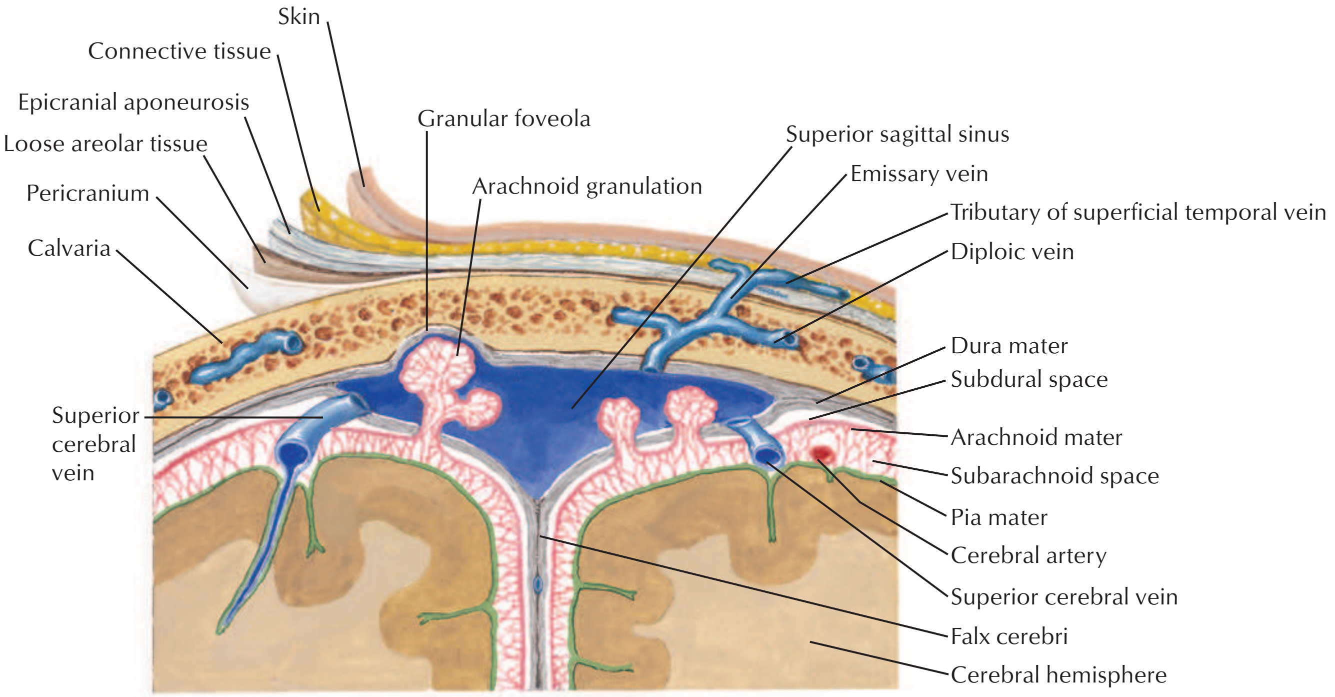
Parietal emissary vein
Frontal diploic vein
Posterior temporal diploic vein
Anterior temporal diploic vein
Occipital emissary vein
Occipital diploic vein
Mastoid emissary vein

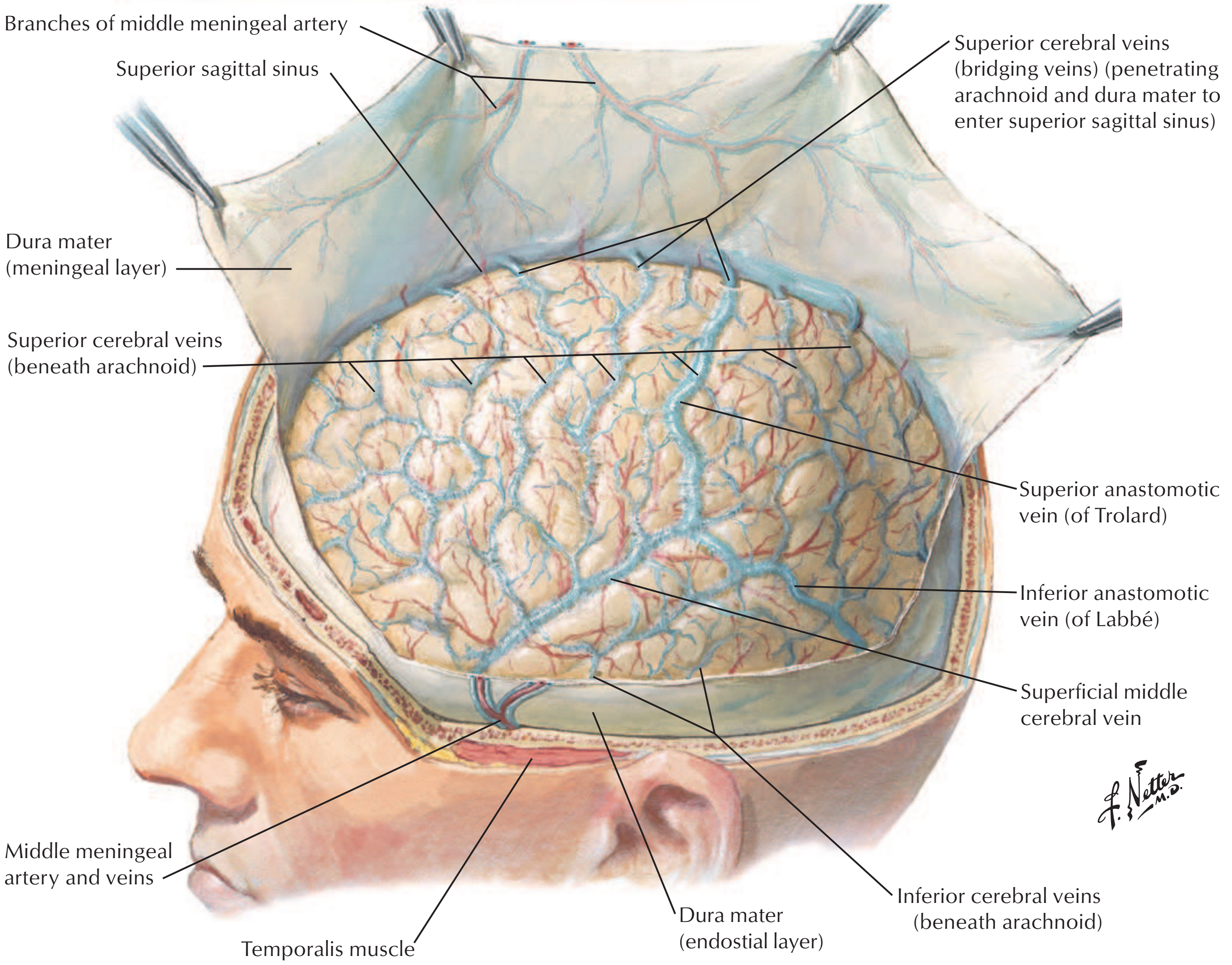
See also Plate 147


Frontal (anterior) and parietal (posterior) branches of middle meningeal artery
Middle meningeal artery
Anterior meningeal branch of anterior ethmoidal artery
Arachnoid granulations
Opening of superior cerebral vein
Lateral (venous) lacuna (of Trolard)
Superior sagittal sinus
Dura mater
Mastoid branch of occipital artery
Internal carotid artery (cavernous segment)
Meningeal branches of ascending pharyngeal artery
Mastoid branch of occipital artery
Middle meningeal artery
Recurrent meningeal branch of lacrimal artery
Accessory meningeal artery
Anterior meningeal branch of anterior ethmoidal artery
Posterior ethmoidal artery
Internal carotid artery and its meningohypophyseal trunk (*phantom*)
Middle meningeal artery
Accessory meningeal artery
Superficial temporal artery
Maxillary artery
Posterior auricular artery
Occipital artery
External carotid artery
Anterior and posterior meningeal branches of vertebral artery
Tentorial, inferior, cavernous, and dorsal meningeal branches of meningohypophyseal trunk

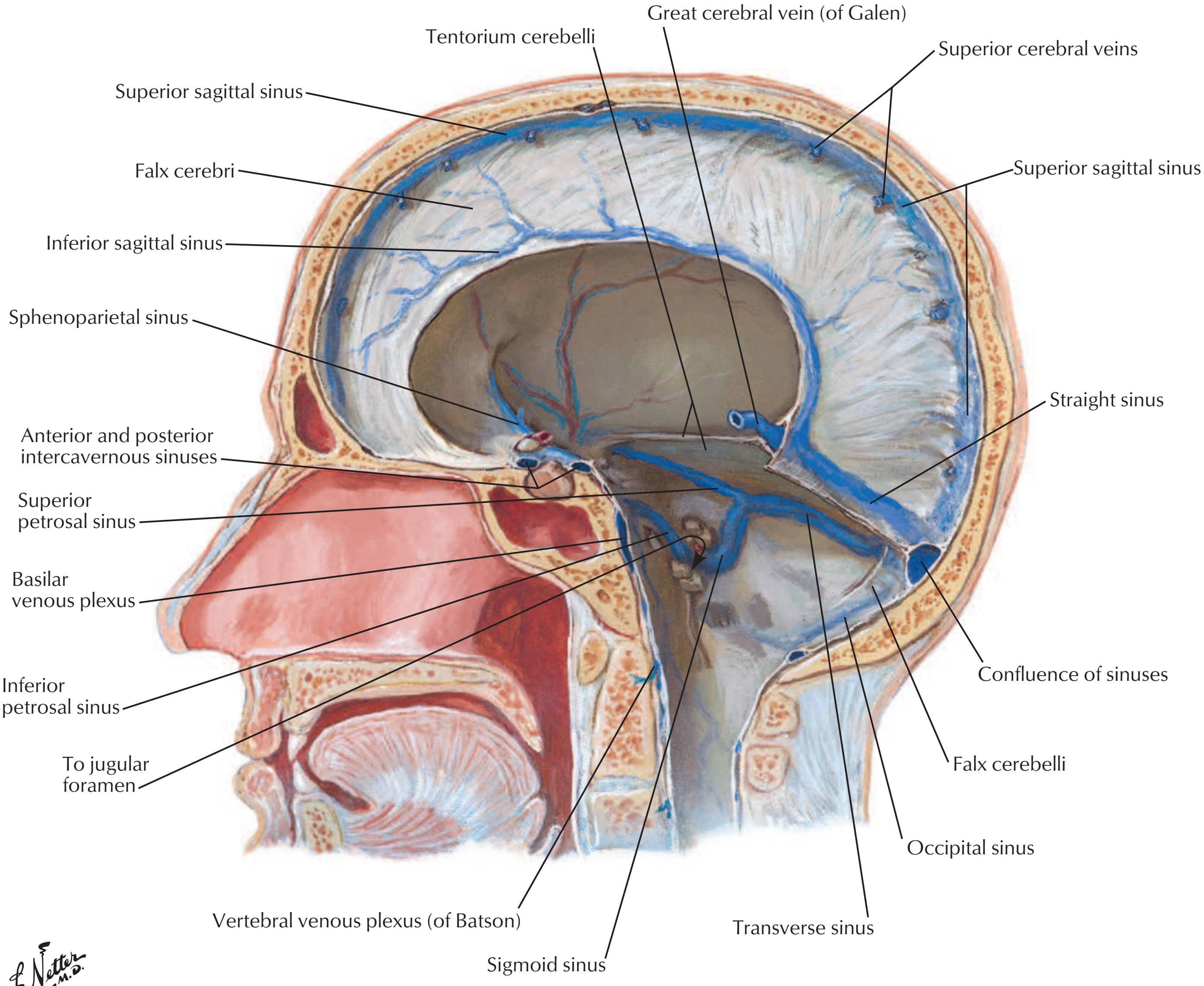
Meninges and Superficial Cerebral Veins

For deep veins of brain see Plate 156


Skin
Connective tissue
Epicranial aponeurosis
Loose areolar tissue
Pericranium
Calvaria
Granular foveola
Arachnoid granulation
Superior sagittal sinus
Emissary vein
Tributary of superficial temporal vein
Diploic vein
Dura mater
Subdural space
Superior cerebral vein
Arachnoid mater
Subarachnoid space
Pia mater
Cerebral artery
Superior cerebral vein
Falx cerebri
Cerebral hemisphere


Branches of middle meningeal artery
Superior sagittal sinus
Superior cerebral veins (bridging veins) (penetrating arachnoid and dura mater to enter superior sagittal sinus)
Dura mater (meningeal layer)
Superior cerebral veins (beneath arachnoid)
Superior anastomotic vein (of Trolard)
Inferior anastomotic vein (of Labbé)
Superficial middle cerebral vein
Middle meningeal artery and veins
Temporalis muscle
Dura mater (endostial layer)
Inferior cerebral veins (beneath arachnoid)

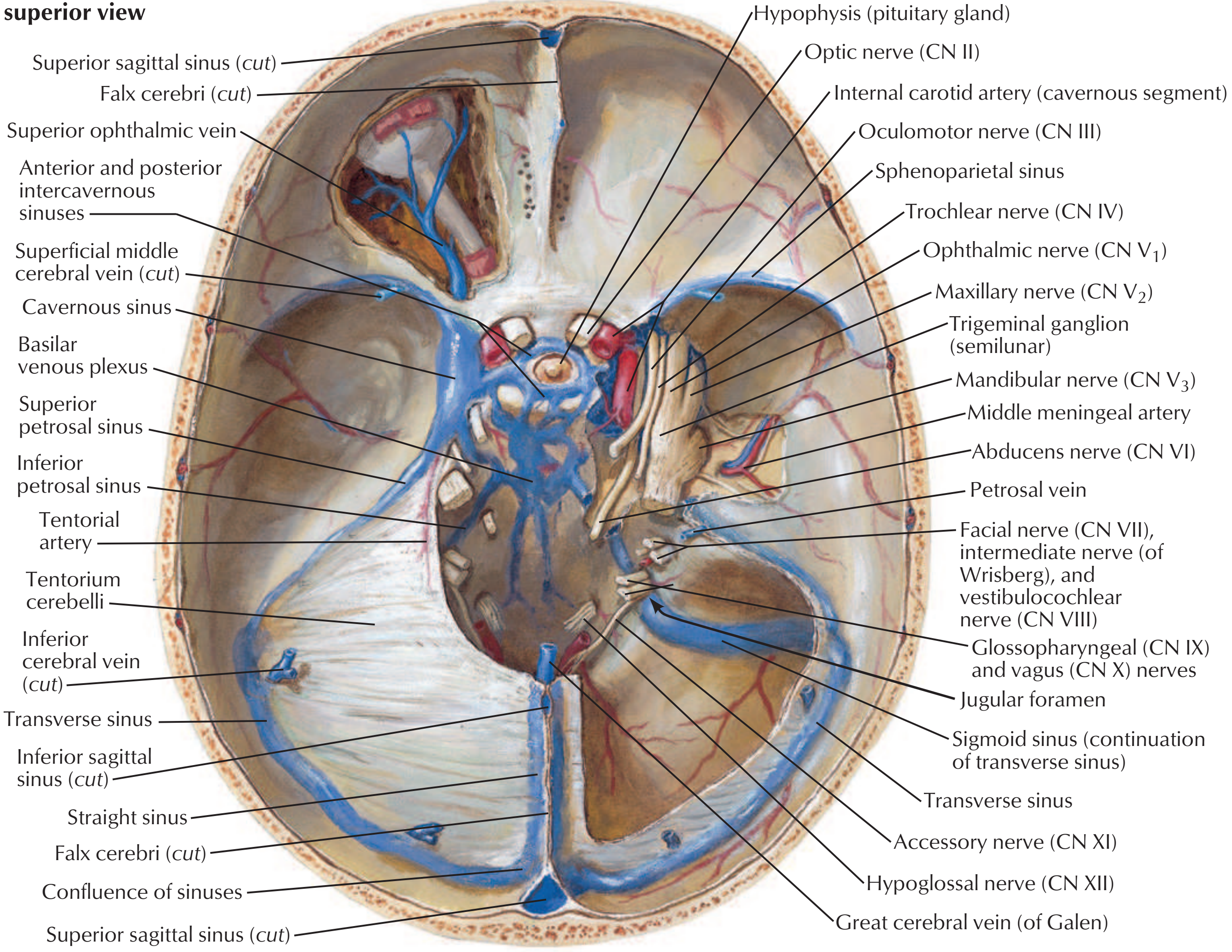
See also **Plates 111, 117**

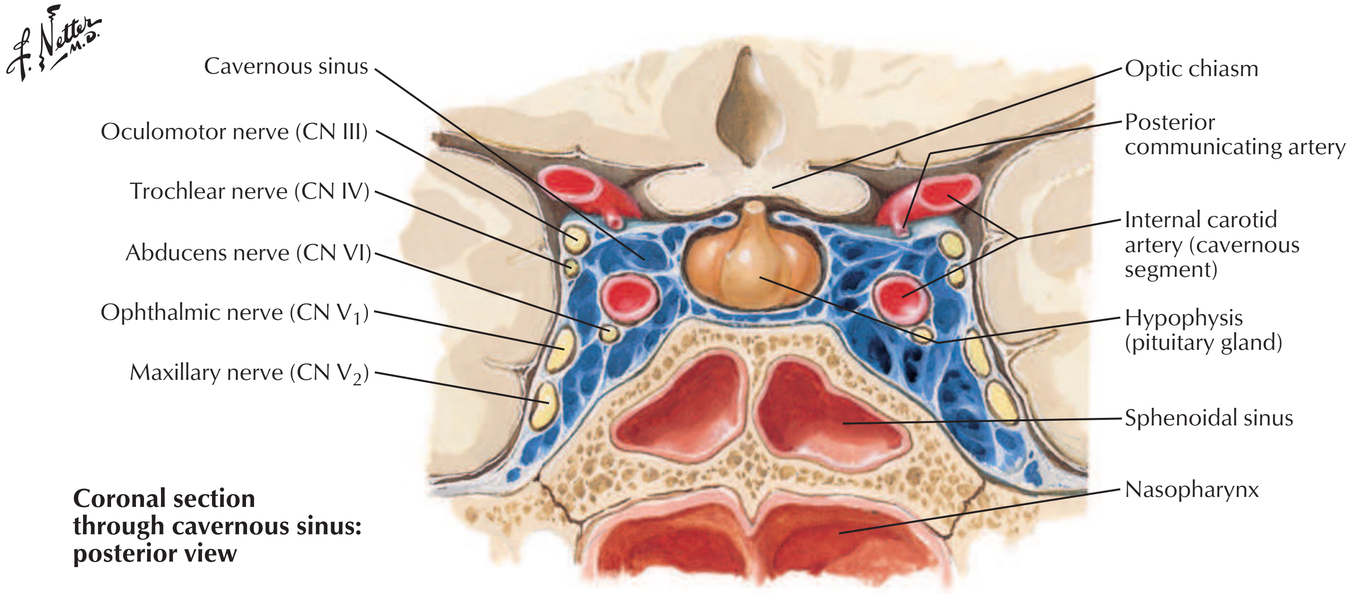

Tentorium cerebelli
Great cerebral vein (of Galen)
Superior cerebral veins
Superior sagittal sinus
Falx cerebri
Inferior sagittal sinus
Sphenoparietal sinus
Superior sagittal sinus
Straight sinus
Anterior and posterior intercavernous sinuses
Superior petrosal sinus
Basilar venous plexus
Inferior petrosal sinus
To jugular foramen
Confluence of sinuses
Falx cerebelli
Occipital sinus
Vertebral venous plexus (of Batson)
Transverse sinus
Sigmoid sinus

Dural Venous Sinuses (continued)

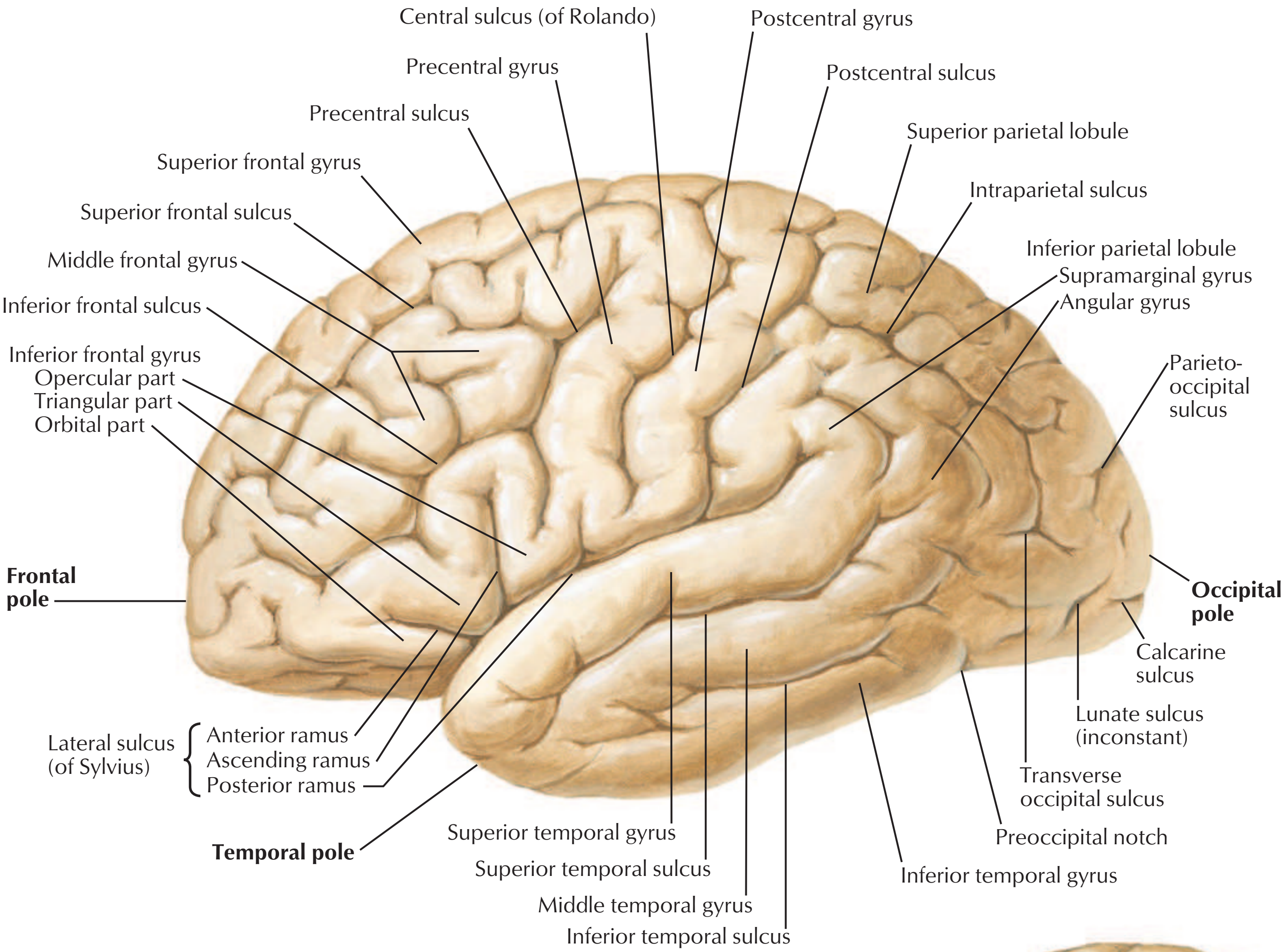
See also Plates 64, 97

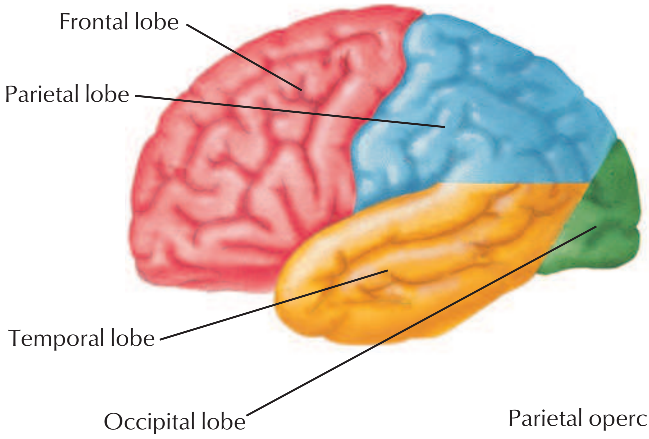
Skull sectioned horizontally: superior view

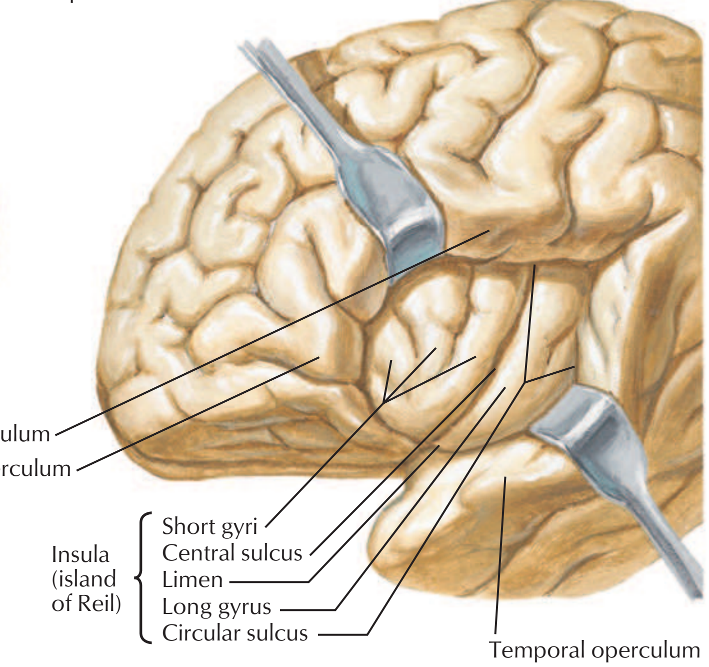

Superior sagittal sinus (*cut*)
Falx cerebri (*cut*)
Superior ophthalmic vein
Anterior and posterior intercavernous sinuses
Superficial middle cerebral vein (*cut*)
Cavernous sinus
Basilar venous plexus
Superior petrosal sinus
Inferior petrosal sinus
Tentorial artery
Tentorium cerebelli
Inferior cerebral vein (*cut*)
Transverse sinus
Inferior sagittal sinus (*cut*)
Straight sinus
Falx cerebri (*cut*)
Confluence of sinuses
Superior sagittal sinus (*cut*)
Hypophysis (pituitary gland)
Optic nerve (CN II)
Internal carotid artery (cavernous segment)
Oculomotor nerve (CN III)
Sphenoparietal sinus
Trochlear nerve (CN IV)
Ophthalmic nerve (CN V_1)
Maxillary nerve (CN V_2)
Trigeminal ganglion (semilunar)
Mandibular nerve (CN V_3)
Middle meningeal artery
Abducens nerve (CN VI)
Petrosal vein
Facial nerve (CN VII), intermediate nerve (of Wrisberg), and vestibulocochlear nerve (CN VIII)
Glossopharyngeal (CN IX) and vagus (CN X) nerves
Jugular foramen
Sigmoid sinus (continuation of transverse sinus)
Transverse sinus
Accessory nerve (CN XI)
Hypoglossal nerve (CN XII)
Great cerebral vein (of Galen)


Cavernous sinus
Oculomotor nerve (CN III)
Trochlear nerve (CN IV)
Abducens nerve (CN VI)
Ophthalmic nerve (CN V_1)
Maxillary nerve (CN V_2)
Optic chiasm
Posterior communicating artery
Internal carotid artery (cavernous segment)
Hypophysis (pituitary gland)
Sphenoidal sinus
Nasopharynx

Coronal section through cavernous sinus: posterior view


Central sulcus (of Rolando)
Postcentral gyrus
Precentral gyrus
Postcentral sulcus
Precentral sulcus
Superior parietal lobule
Superior frontal gyrus
Intraparietal sulcus
Superior frontal sulcus
Inferior parietal lobule
Supramarginal gyrus
Angular gyrus
Middle frontal gyrus
Inferior frontal sulcus
Inferior frontal gyrus
Opercular part
Triangular part
Orbital part
Parieto-occipital sulcus
Frontal pole
Occipital pole
Calcarine sulcus
Lunate sulcus (inconstant)
Lateral sulcus (of Sylvius)
Anterior ramus
Ascending ramus
Posterior ramus
Transverse occipital sulcus
Temporal pole
Superior temporal gyrus
Preoccipital notch
Superior temporal sulcus
Inferior temporal gyrus
Middle temporal gyrus
Inferior temporal sulcus

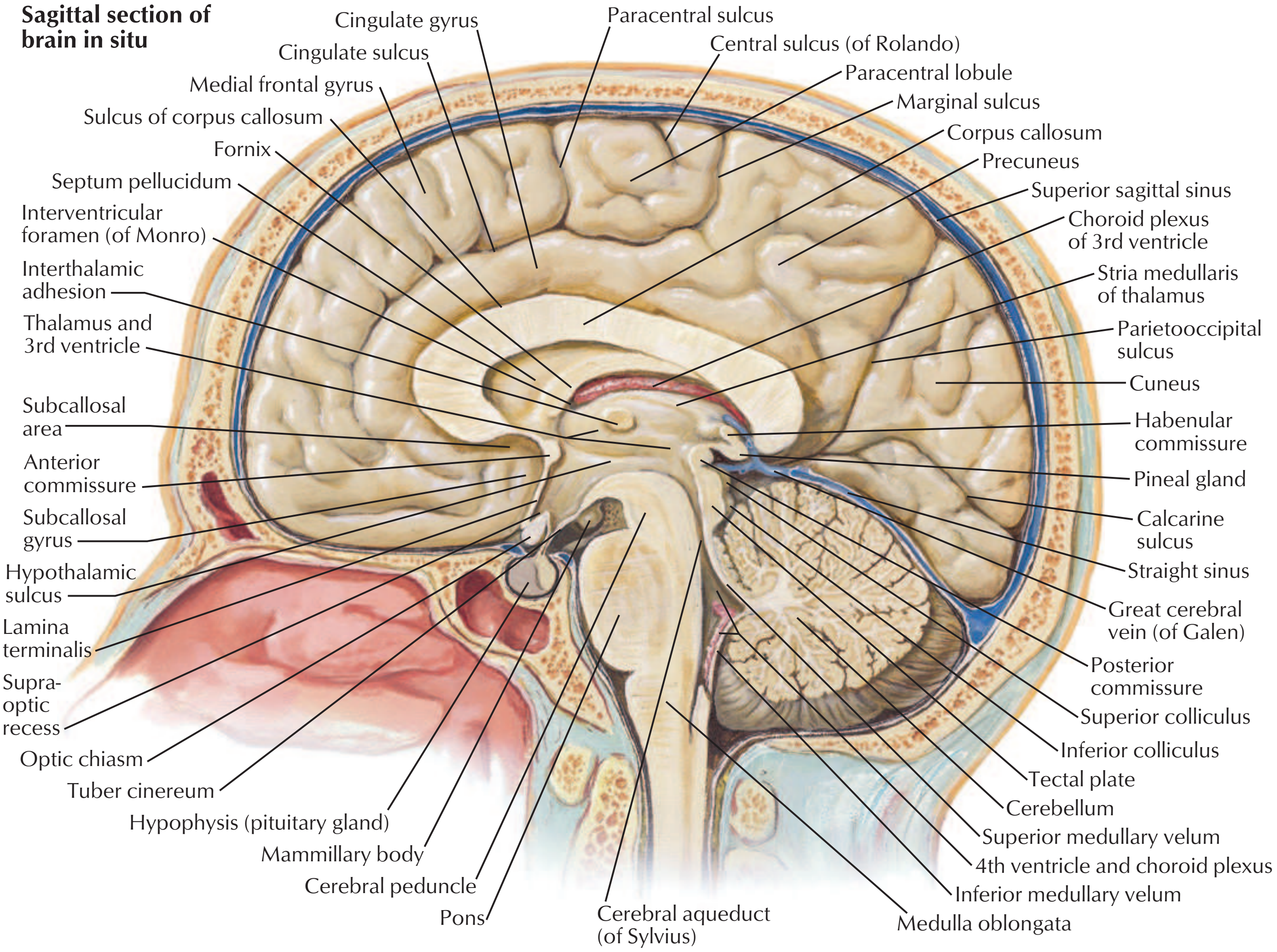

Frontal lobe
Parietal lobe
Temporal lobe
Occipital lobe


Parietal operculum
Frontal operculum
Insula (island of Reil)
Short gyri
Central sulcus
Limen
Long gyrus
Circular sulcus
Temporal operculum

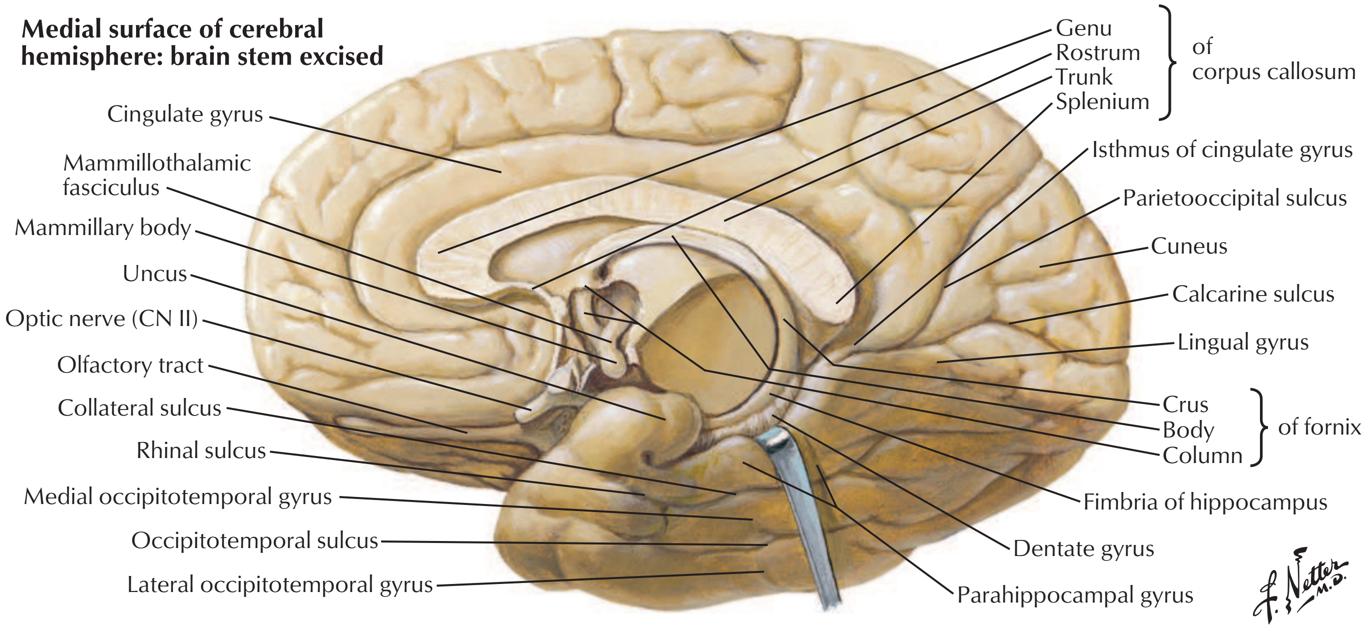
Brain: Medial Views

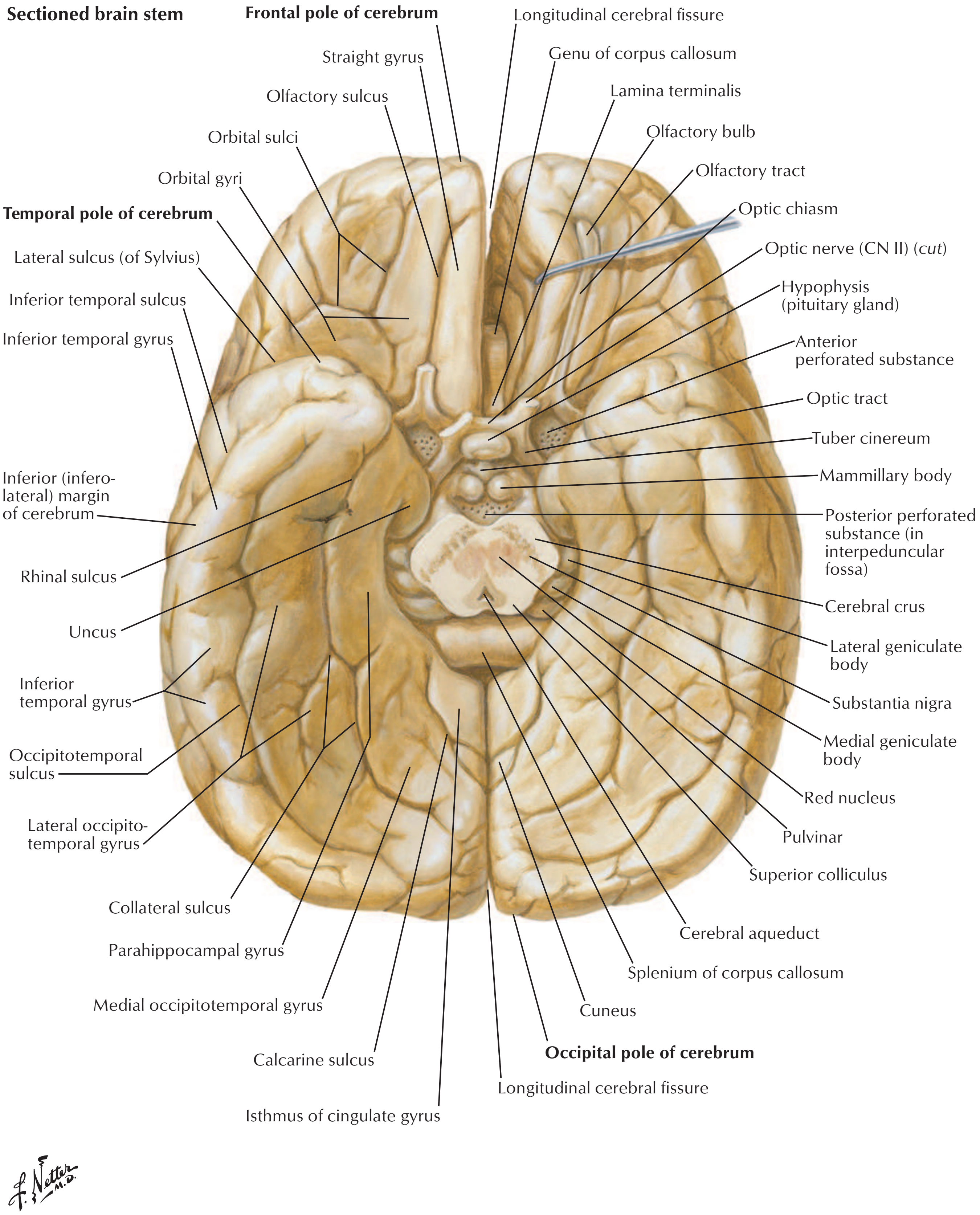
See also Plate 158

Sagittal section of brain in situ


Cingulate gyrus
Cingulate sulcus
Medial frontal gyrus
Sulcus of corpus callosum
Fornix
Septum pellucidum
Interventricular foramen (of Monro)
Interthalamic adhesion
Thalamus and 3rd ventricle
Subcallosal area
Anterior commissure
Subcallosal gyrus
Hypothalamic sulcus
Lamina terminalis
Supra-optic recess
Optic chiasm
Tuber cinereum
Hypophysis (pituitary gland)
Mammillary body
Cerebral peduncle
Pons
Cerebral aqueduct (of Sylvius)
Paracentral sulcus
Central sulcus (of Rolando)
Paracentral lobule
Marginal sulcus
Corpus callosum
Precuneus
Superior sagittal sinus
Choroid plexus of 3rd ventricle
Stria medullaris of thalamus
Parietooccipital sulcus
Cuneus
Habenular commissure
Pineal gland
Calcarine sulcus
Straight sinus
Great cerebral vein (of Galen)
Posterior commissure
Superior colliculus
Inferior colliculus
Tectal plate
Cerebellum
Superior medullary velum
4th ventricle and choroid plexus
Inferior medullary velum
Medulla oblongata

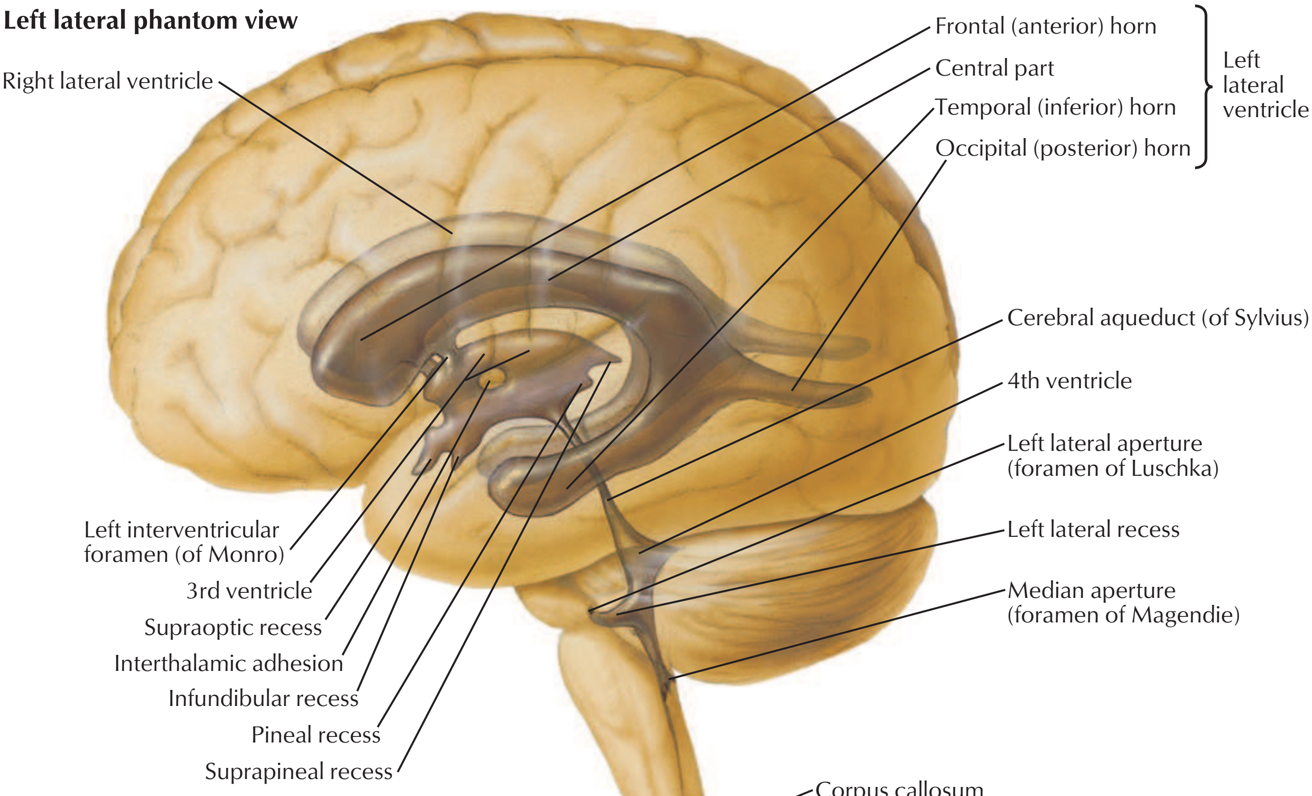
Medial surface of cerebral hemisphere: brain stem excised

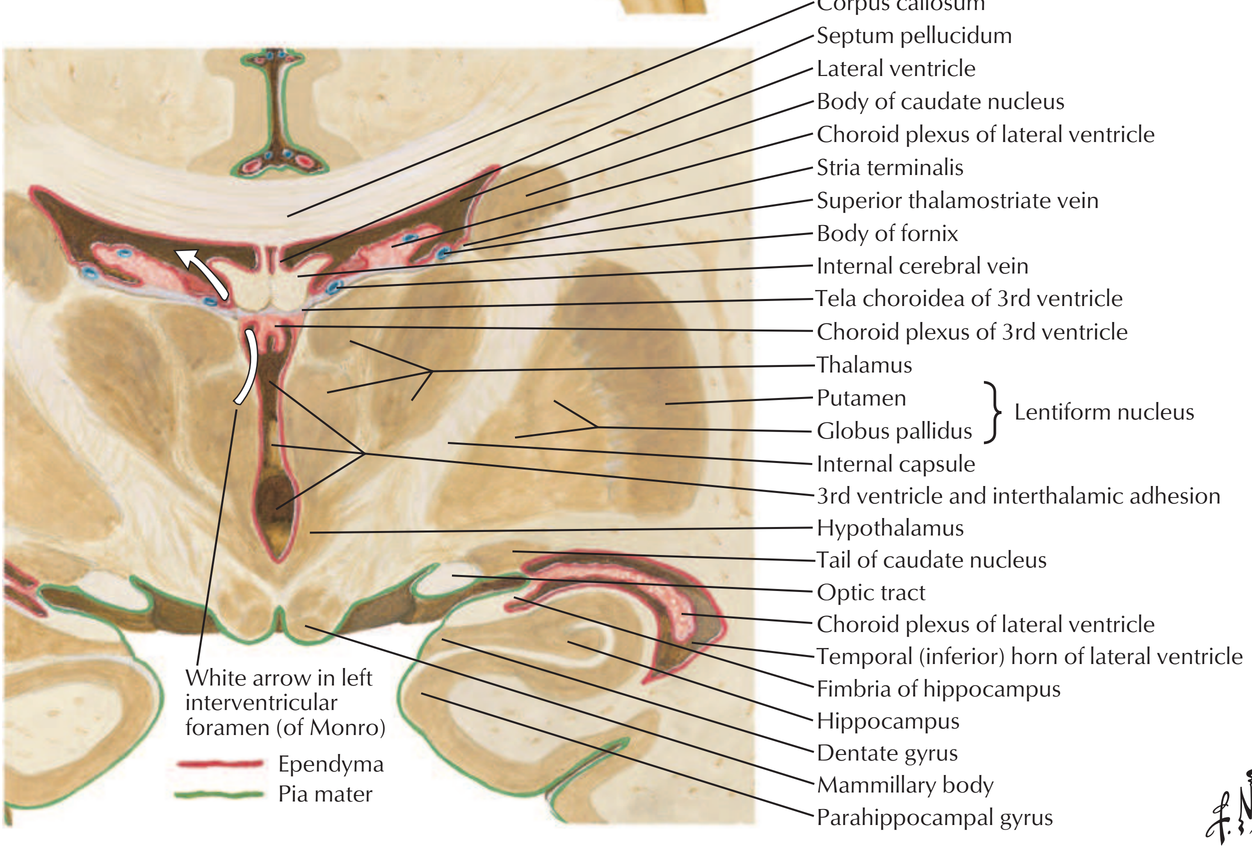

Cingulate gyrus
Mammillothalamic fasciculus
Mammillary body
Uncus
Optic nerve (CN II)
Olfactory tract
Collateral sulcus
Rhinal sulcus
Medial occipitotemporal gyrus
Occipitotemporal sulcus
Lateral occipitotemporal gyrus
Genu
Rostrum
Trunk
Splenium
of corpus callosum
Isthmus of cingulate gyrus
Parietooccipital sulcus
Cuneus
Calcarine sulcus
Lingual gyrus
Crus
Body
Column
of fornix
Fimbria of hippocampus
Dentate gyrus
Parahippocampal gyrus


Sectioned brain stem
Frontal pole of cerebrum
Straight gyrus
Olfactory sulcus
Orbital sulci
Orbital gyri
Temporal pole of cerebrum
Lateral sulcus (of Sylvius)
Inferior temporal sulcus
Inferior temporal gyrus
Inferior (infero-lateral) margin of cerebrum
Rhinal sulcus
Uncus
Inferior temporal gyrus
Occipitotemporal sulcus
Lateral occipito-temporal gyrus
Collateral sulcus
Parahippocampal gyrus
Medial occipitotemporal gyrus
Calcarine sulcus
Isthmus of cingulate gyrus
Longitudinal cerebral fissure
Genu of corpus callosum
Lamina terminalis
Olfactory bulb
Olfactory tract
Optic chiasm
Optic nerve (CN II) (cut)
Hypophysis (pituitary gland)
Anterior perforated substance
Optic tract
Tuber cinereum
Mammillary body
Posterior perforated substance (in interpeduncular fossa)
Cerebral crus
Lateral geniculate body
Substantia nigra
Medial geniculate body
Red nucleus
Pulvinar
Superior colliculus
Cerebral aqueduct
Splenium of corpus callosum
Cuneus
Occipital pole of cerebrum
Longitudinal cerebral fissure
F. Netter M.D.

Ventricles of Brain

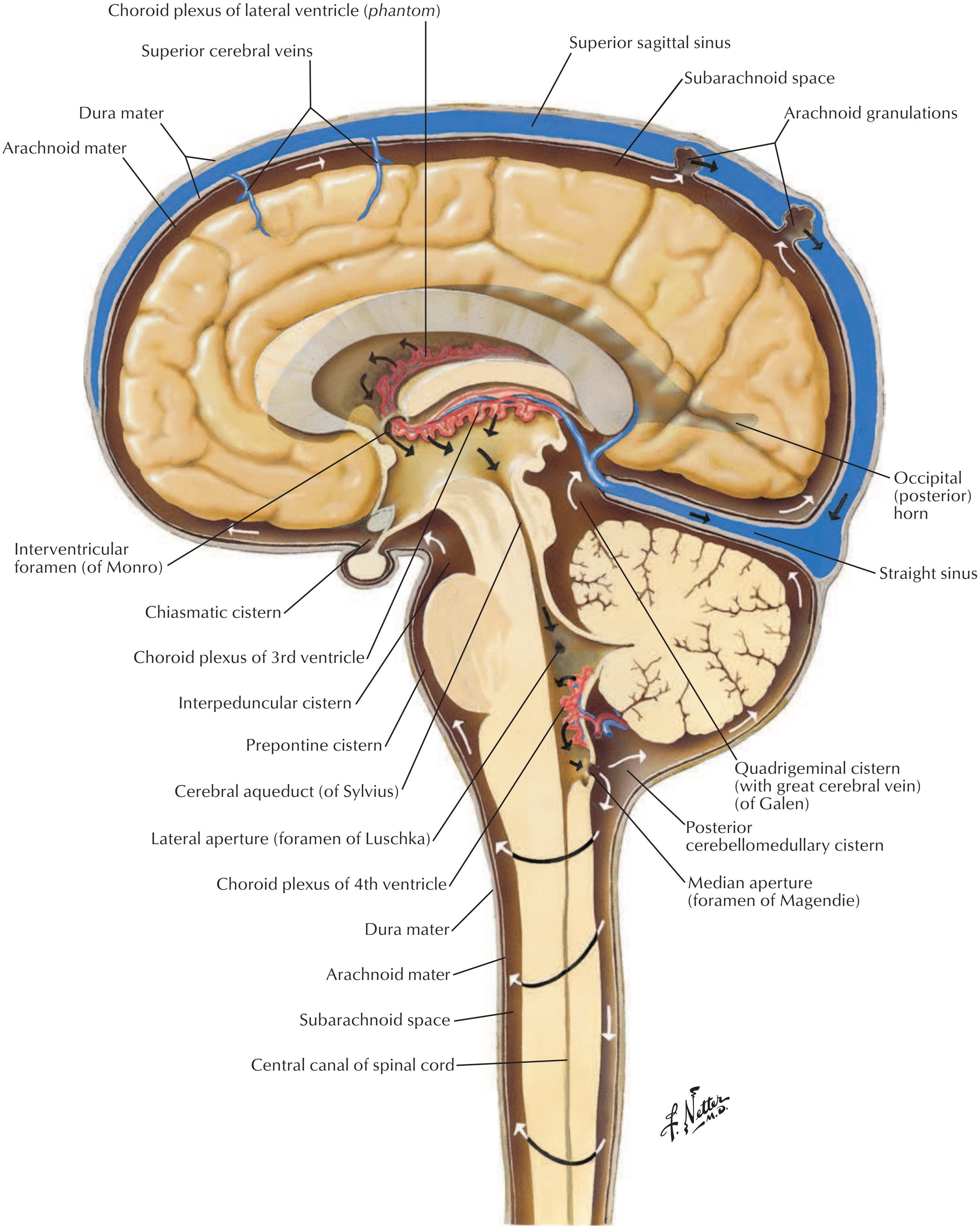
Left lateral phantom view

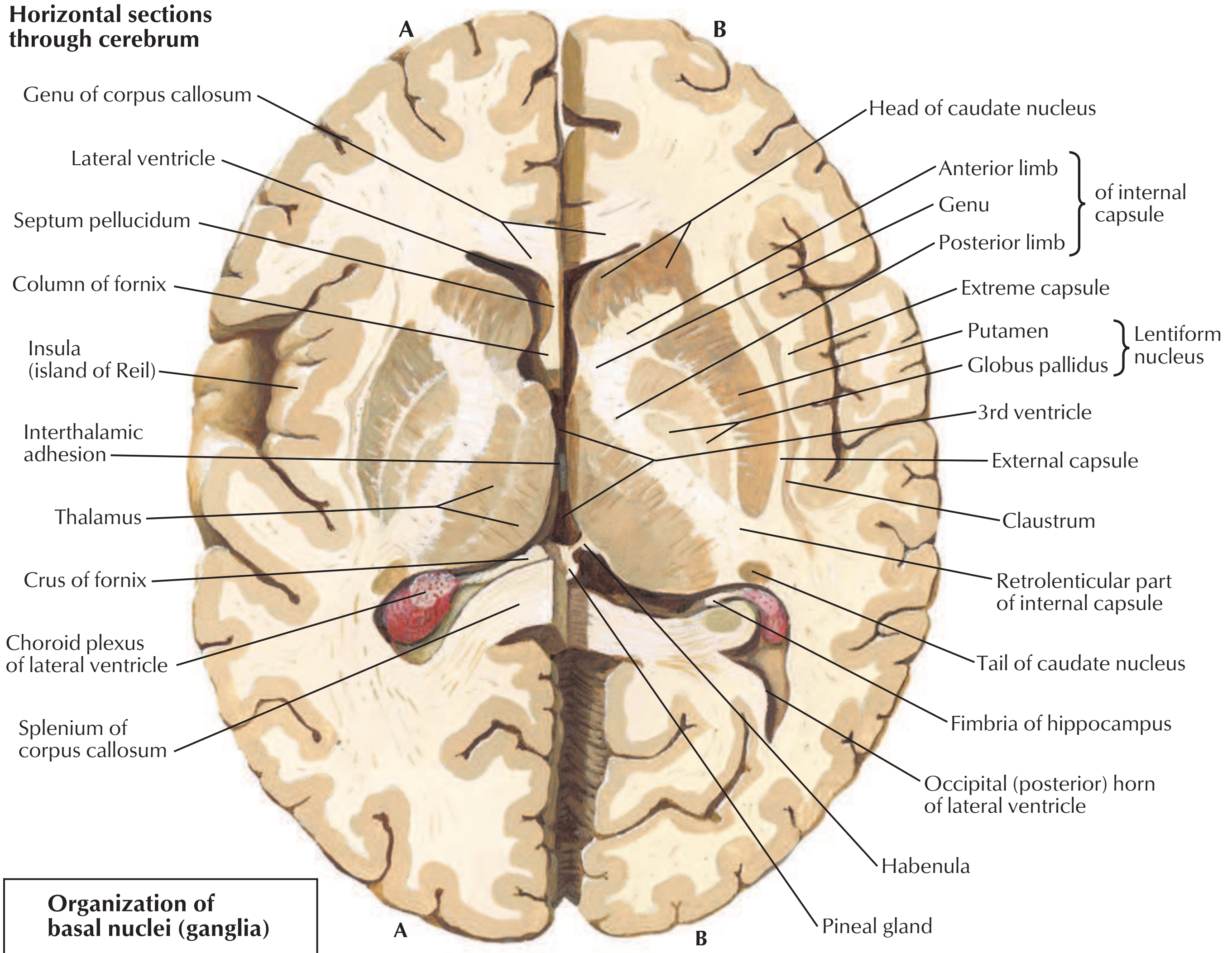

Right lateral ventricle
Frontal (anterior) horn
Central part
Temporal (inferior) horn
Occipital (posterior) horn
Left lateral ventricle
Cerebral aqueduct (of Sylvius)
4th ventricle
Left lateral aperture (foramen of Luschka)
Left lateral recess
Median aperture (foramen of Magendie)
Left interventricular foramen (of Monro)
3rd ventricle
Supraoptic recess
Interthalamic adhesion
Infundibular recess
Pineal recess
Suprapineal recess


Corpus callosum
Septum pellucidum
Lateral ventricle
Body of caudate nucleus
Choroid plexus of lateral ventricle
Stria terminalis
Superior thalamostriate vein
Body of fornix
Internal cerebral vein
Tela choroidea of 3rd ventricle
Choroid plexus of 3rd ventricle
Thalamus
Putamen
Globus pallidus
Lentiform nucleus
Internal capsule
3rd ventricle and interthalamic adhesion
Hypothalamus
Tail of caudate nucleus
Optic tract
Choroid plexus of lateral ventricle
Temporal (inferior) horn of lateral ventricle
Fimbria of hippocampus
Hippocampus
Dentate gyrus
Mammillary body
Parahippocampal gyrus
White arrow in left interventricular foramen (of Monro)
Ependyma
Pia mater

Coronal section of brain: posterior view

See also Plates 119, 157


Choroid plexus of lateral ventricle (*phantom*)
Superior cerebral veins
Dura mater
Arachnoid mater
Superior sagittal sinus
Subarachnoid space
Arachnoid granulations
Occipital (posterior) horn
Straight sinus
Interventricular foramen (of Monro)
Chiasmatic cistern
Choroid plexus of 3rd ventricle
Interpeduncular cistern
Prepontine cistern
Cerebral aqueduct (of Sylvius)
Lateral aperture (foramen of Luschka)
Choroid plexus of 4th ventricle
Dura mater
Arachnoid mater
Subarachnoid space
Central canal of spinal cord
Quadrigeminal cistern (with great cerebral vein) (of Galen)
Posterior cerebellomedullary cistern
Median aperture (foramen of Magendie)
F. Netter M.D.



Horizontal sections through cerebrum

A
B
Genu of corpus callosum
Lateral ventricle
Septum pellucidum
Column of fornix
Insula (island of Reil)
Interthalamic adhesion
Thalamus
Crus of fornix
Choroid plexus of lateral ventricle
Splenium of corpus callosum
Head of caudate nucleus
Anterior limb
Genu
Posterior limb
of internal capsule
Extreme capsule
Putamen
Globus pallidus
Lentiform nucleus
3rd ventricle
External capsule
Claustrum
Retrolenticular part of internal capsule
Tail of caudate nucleus
Fimbria of hippocampus
Occipital (posterior) horn of lateral ventricle
Habenula
Pineal gland
A
B

Organization of basal nuclei (ganglia)

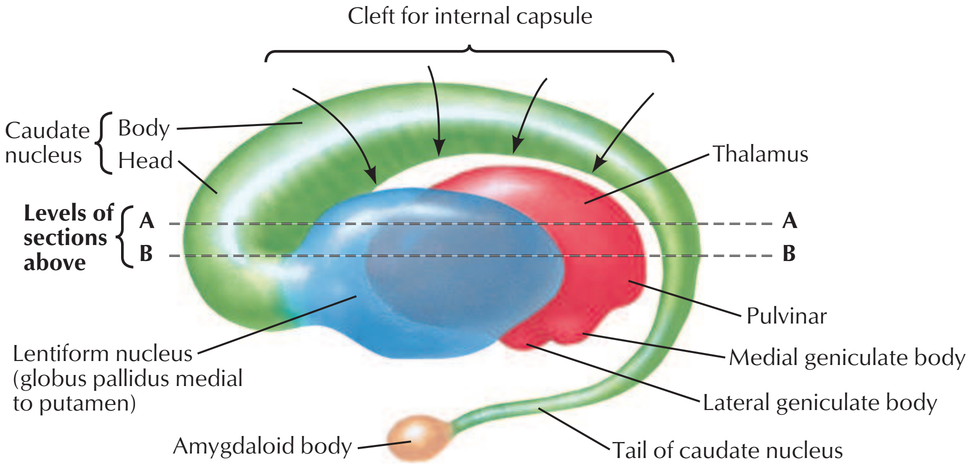
Caudate nucleus — Putamen — Globus pallidus

Caudate nucleus + Putamen: Striatum

Putamen + Globus pallidus: Lentiform nucleus

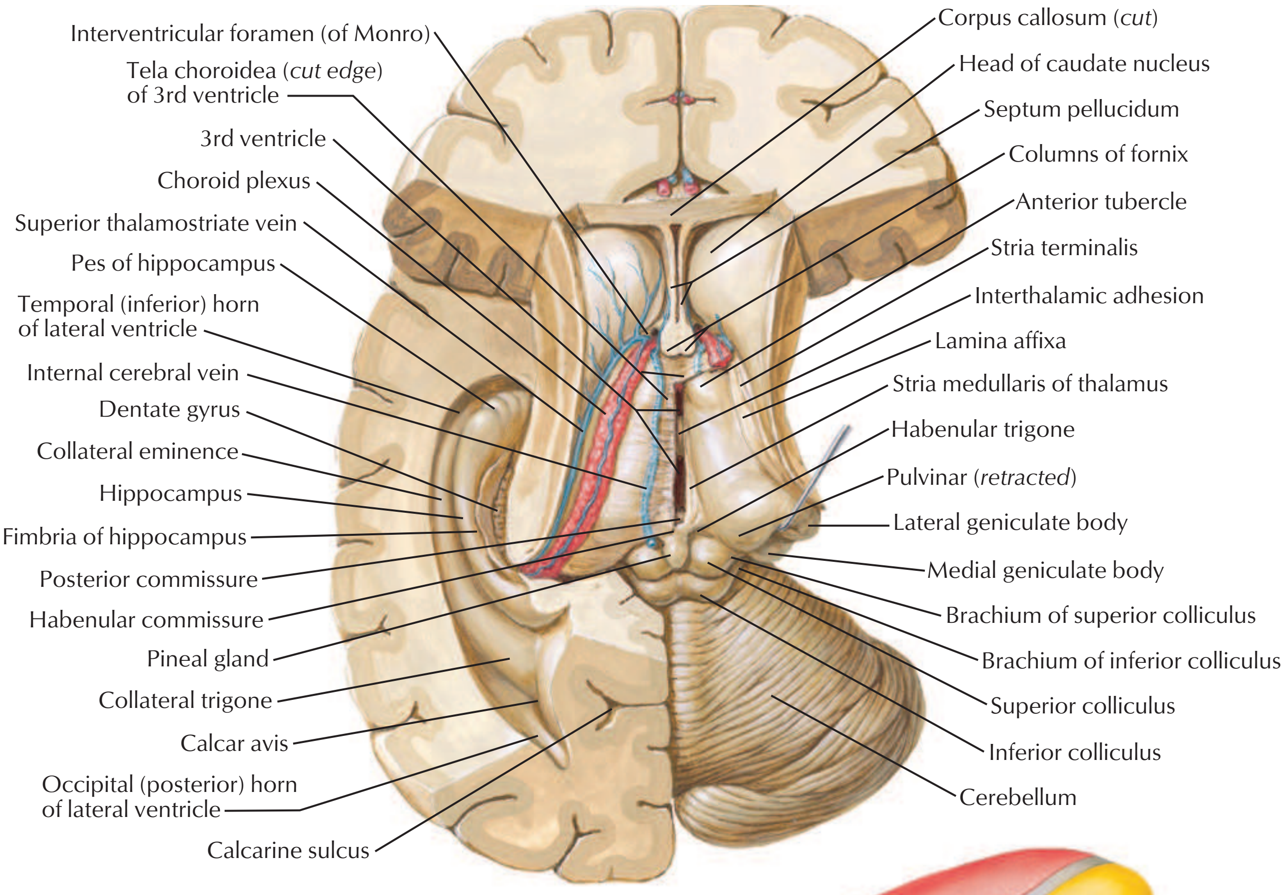
Striatum + Lentiform nucleus: Corpus striatum

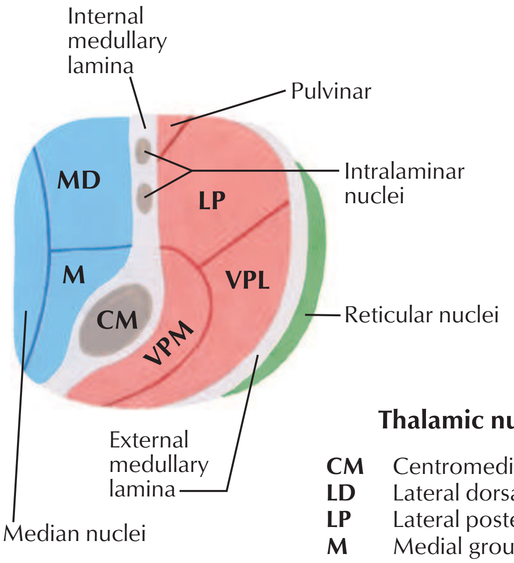
Corpus striatum: Basal nuclei (ganglia)



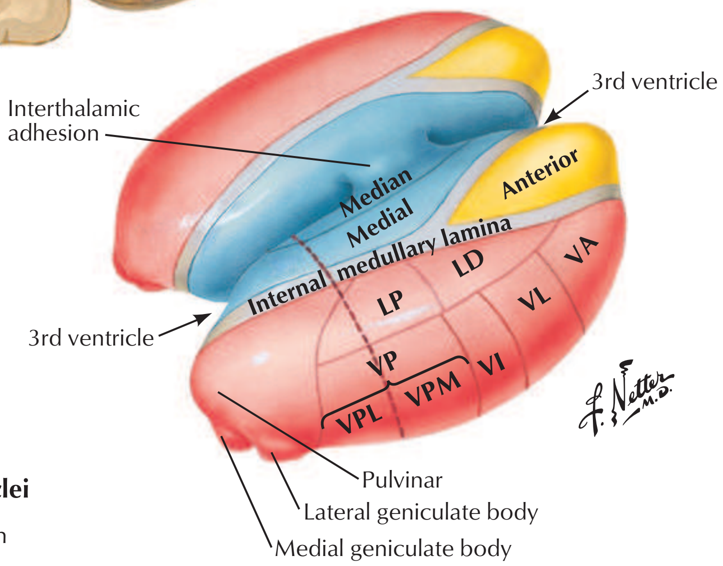
Cleft for internal capsule
Caudate nucleus
Body
Head
Thalamus
Levels of sections above
A
B
A
B
Pulvinar
Medial geniculate body
Lateral geniculate body
Lentiform nucleus (globus pallidus medial to putamen)
Amygdaloid body
Tail of caudate nucleus

Interrelationship of thalamus, lentiform nucleus, caudate nucleus, and amygdaloid body (schema): left lateral view


Interventricular foramen (of Monro)
Tela choroidea (*cut edge*) of 3rd ventricle
3rd ventricle
Choroid plexus
Superior thalamostriate vein
Pes of hippocampus
Temporal (inferior) horn of lateral ventricle
Internal cerebral vein
Dentate gyrus
Collateral eminence
Hippocampus
Fimbria of hippocampus
Posterior commissure
Habenular commissure
Pineal gland
Collateral trigone
Calcar avis
Occipital (posterior) horn of lateral ventricle
Calcarine sulcus
Corpus callosum (*cut*)
Head of caudate nucleus
Septum pellucidum
Columns of fornix
Anterior tubercle
Stria terminalis
Interthalamic adhesion
Lamina affixa
Stria medullaris of thalamus
Habenular trigone
Pulvinar (*retracted*)
Lateral geniculate body
Medial geniculate body
Brachium of superior colliculus
Brachium of inferior colliculus
Superior colliculus
Inferior colliculus
Cerebellum


Internal medullary lamina
Pulvinar
MD
LP
Intralaminar nuclei
M
VPL
CM
VPM
Reticular nuclei
External medullary lamina
Median nuclei

Schematic section through thalamus
(at level of broken line shown in figure at right)


3rd ventricle
Interthalamic adhesion
Median
Medial
Anterior
Internal medullary lamina
LD
VA
LP
VL
3rd ventricle
VP
VI
VPM
VPL
Pulvinar
Lateral geniculate body
Medial geniculate body

Schematic representation of thalamus
(external medullary lamina and reticular nuclei removed)

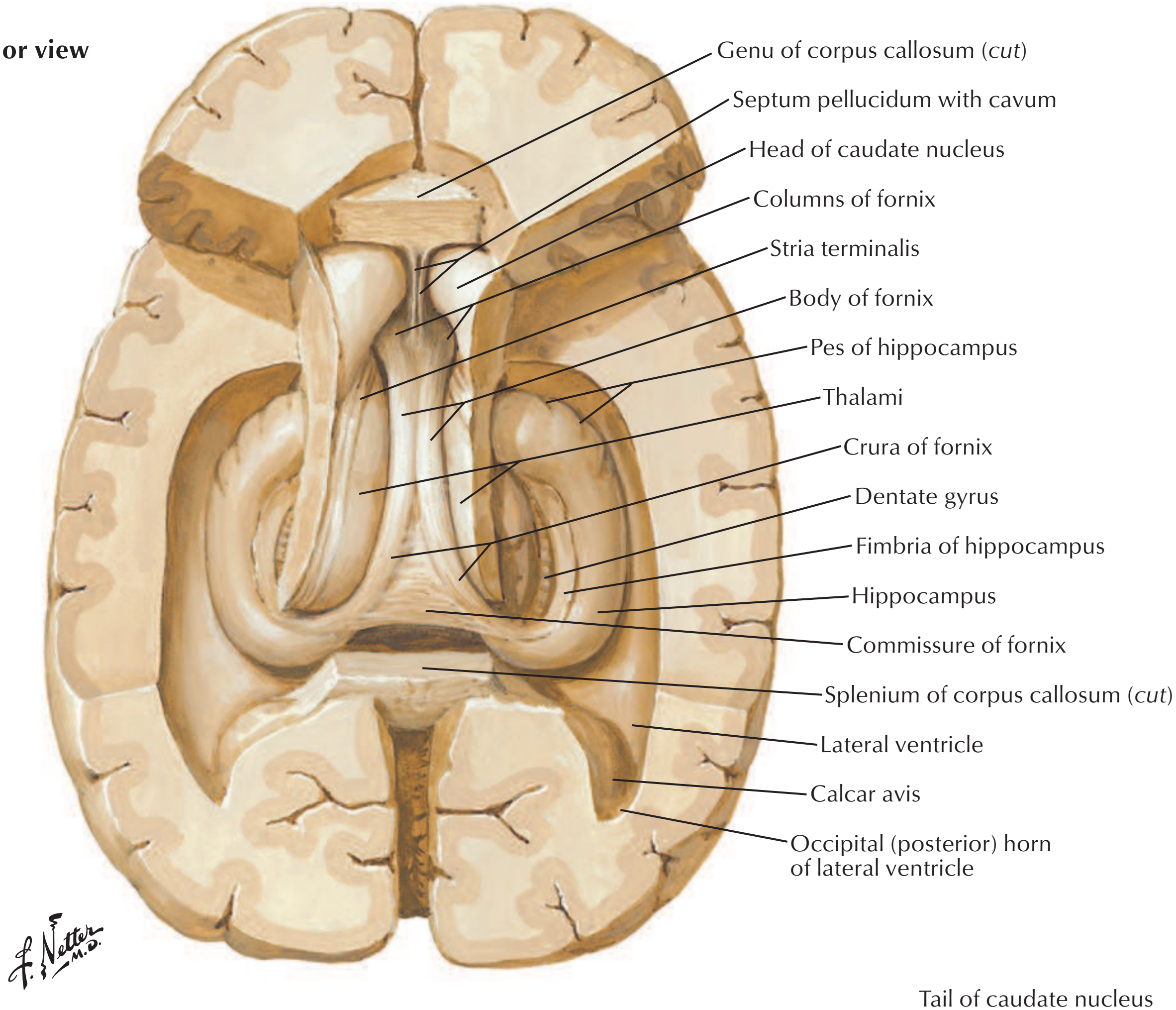
Thalamic nuclei

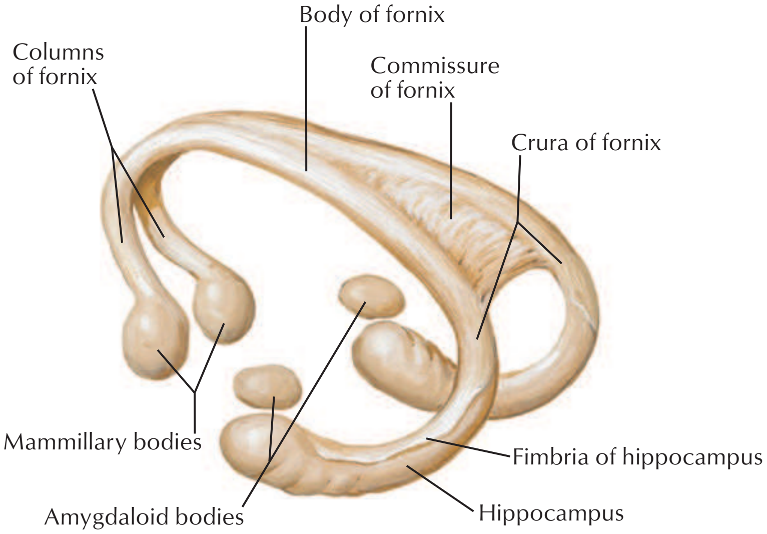
CM	Centromedian
LD	Lateral dorsal
LP	Lateral posterior
M	Medial group
MD	Medial dorsal
VA	Ventral anterior
VI	Ventral intermedial
VL	Ventral lateral
VP	Ventral posterior (ventrodorsal)
VPL	Ventral posterolateral
VPM	Ventral posteromedial

🟥 **Lateral cell mass**
🟦 **Medial and median cell mass**
🟨 **Anterior cell mass**

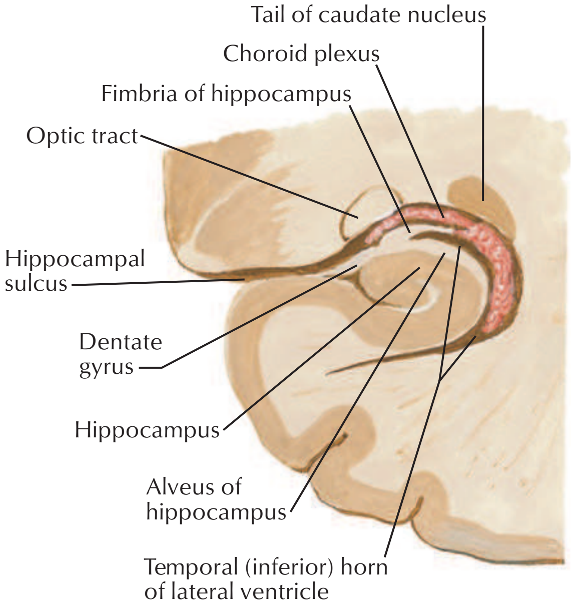
Hippocampus and Fornix

Superior view

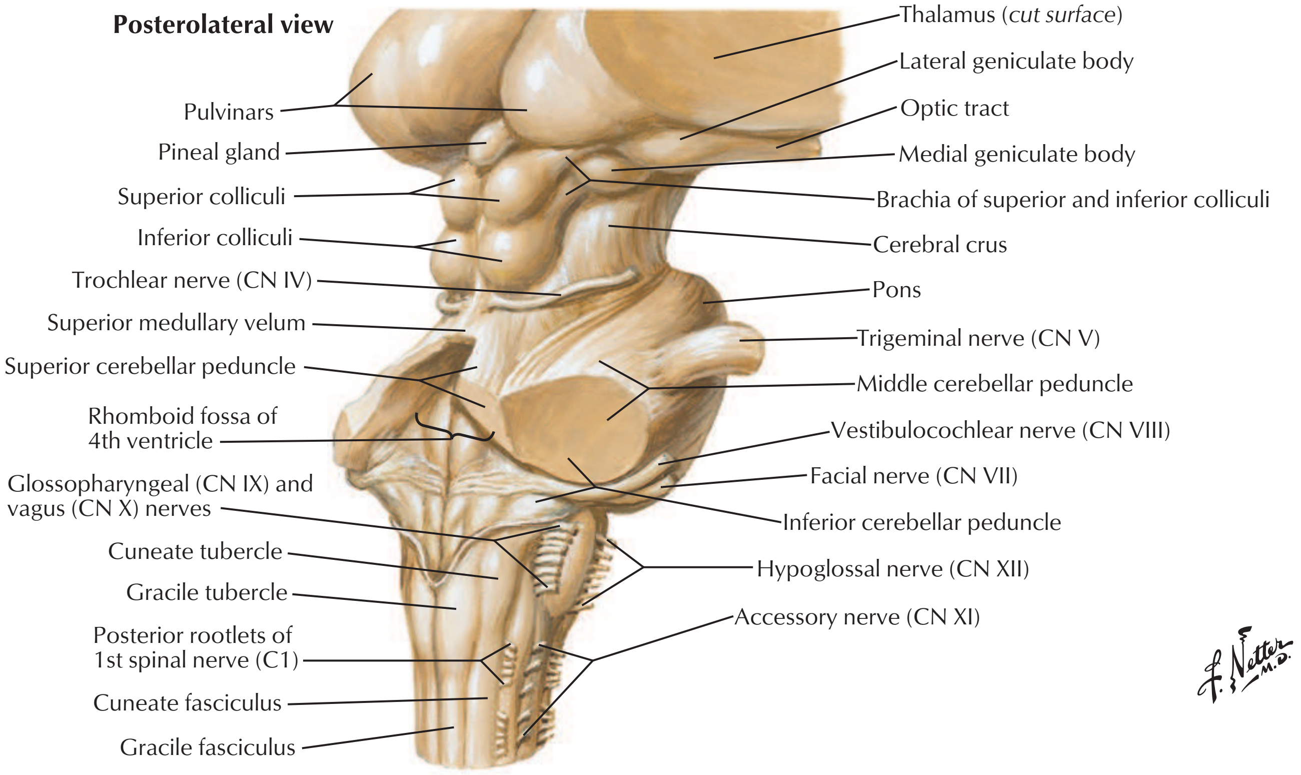

Genu of corpus callosum (*cut*)
Septum pellucidum with cavum
Head of caudate nucleus
Columns of fornix
Stria terminalis
Body of fornix
Pes of hippocampus
Thalami
Crura of fornix
Dentate gyrus
Fimbria of hippocampus
Hippocampus
Commissure of fornix
Splenium of corpus callosum (*cut*)
Lateral ventricle
Calcar avis
Occipital (posterior) horn of lateral ventricle


Body of fornix
Columns of fornix
Commissure of fornix
Crura of fornix
Mammillary bodies
Fimbria of hippocampus
Amygdaloid bodies
Hippocampus

Fornix: schema

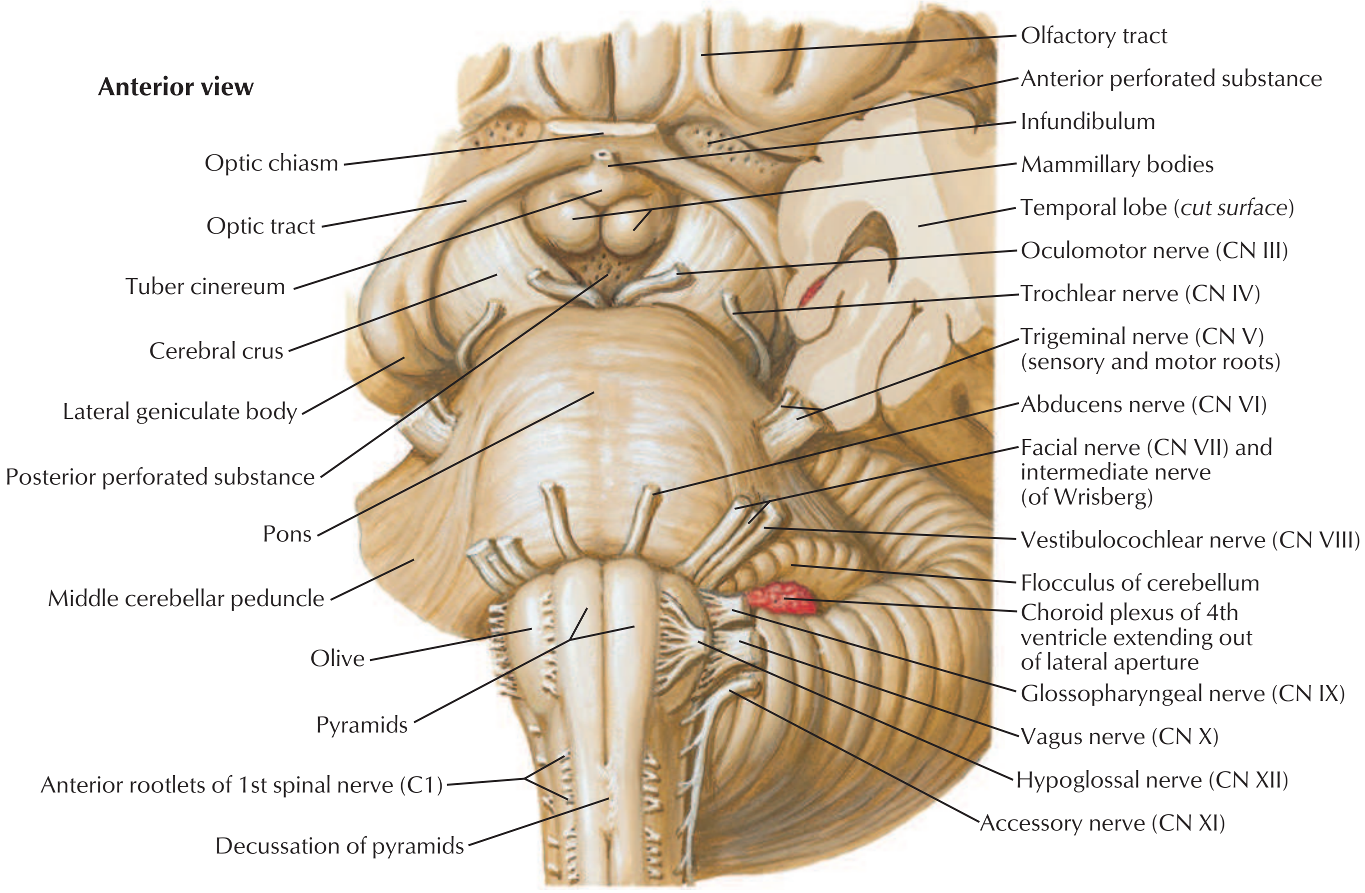

Tail of caudate nucleus
Choroid plexus
Fimbria of hippocampus
Optic tract
Hippocampal sulcus
Dentate gyrus
Hippocampus
Alveus of hippocampus
Temporal (inferior) horn of lateral ventricle

Coronal section: posterior view



Posterolateral view

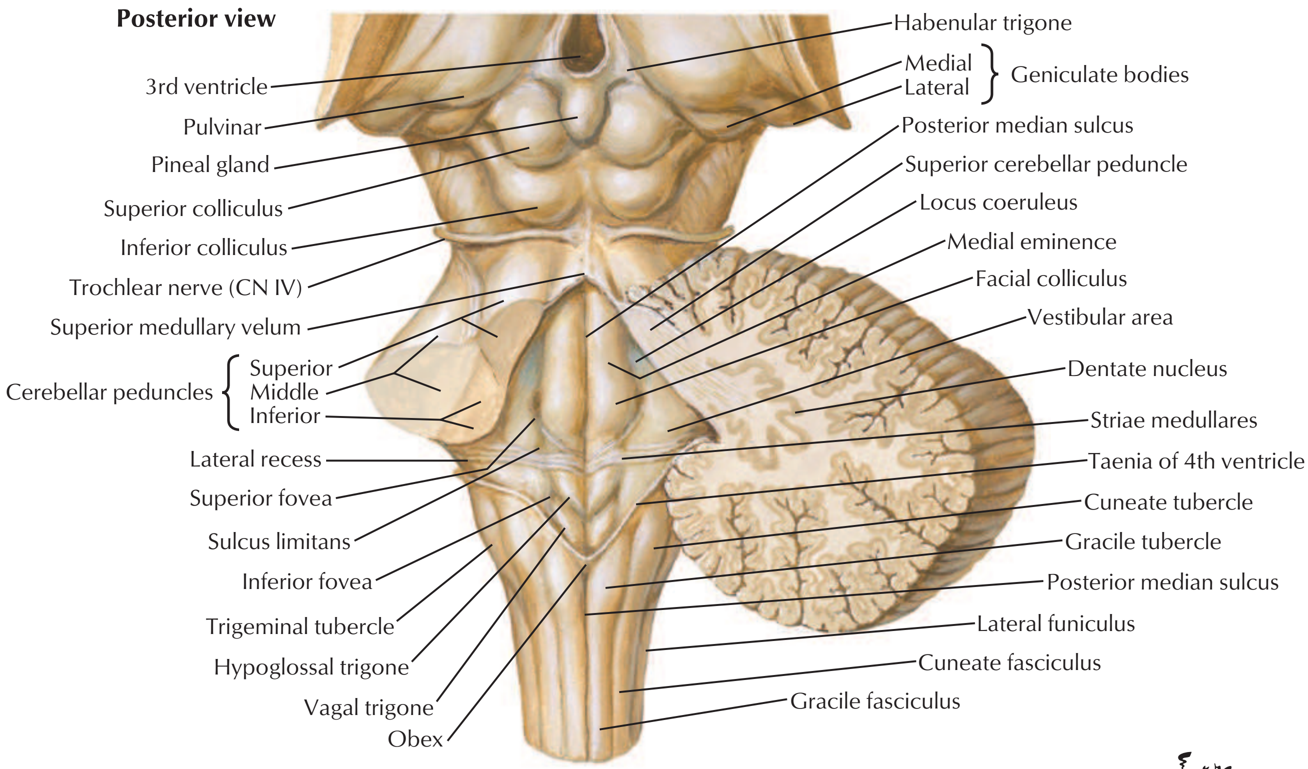
Pulvinars
Pineal gland
Superior colliculi
Inferior colliculi
Trochlear nerve (CN IV)
Superior medullary velum
Superior cerebellar peduncle
Rhomboid fossa of 4th ventricle
Glossopharyngeal (CN IX) and vagus (CN X) nerves
Cuneate tubercle
Gracile tubercle
Posterior rootlets of 1st spinal nerve (C1)
Cuneate fasciculus
Gracile fasciculus
Thalamus (*cut surface*)
Lateral geniculate body
Optic tract
Medial geniculate body
Brachia of superior and inferior colliculi
Cerebral crus
Pons
Trigeminal nerve (CN V)
Middle cerebellar peduncle
Vestibulocochlear nerve (CN VIII)
Facial nerve (CN VII)
Inferior cerebellar peduncle
Hypoglossal nerve (CN XII)
Accessory nerve (CN XI)
F. Netter M.D.

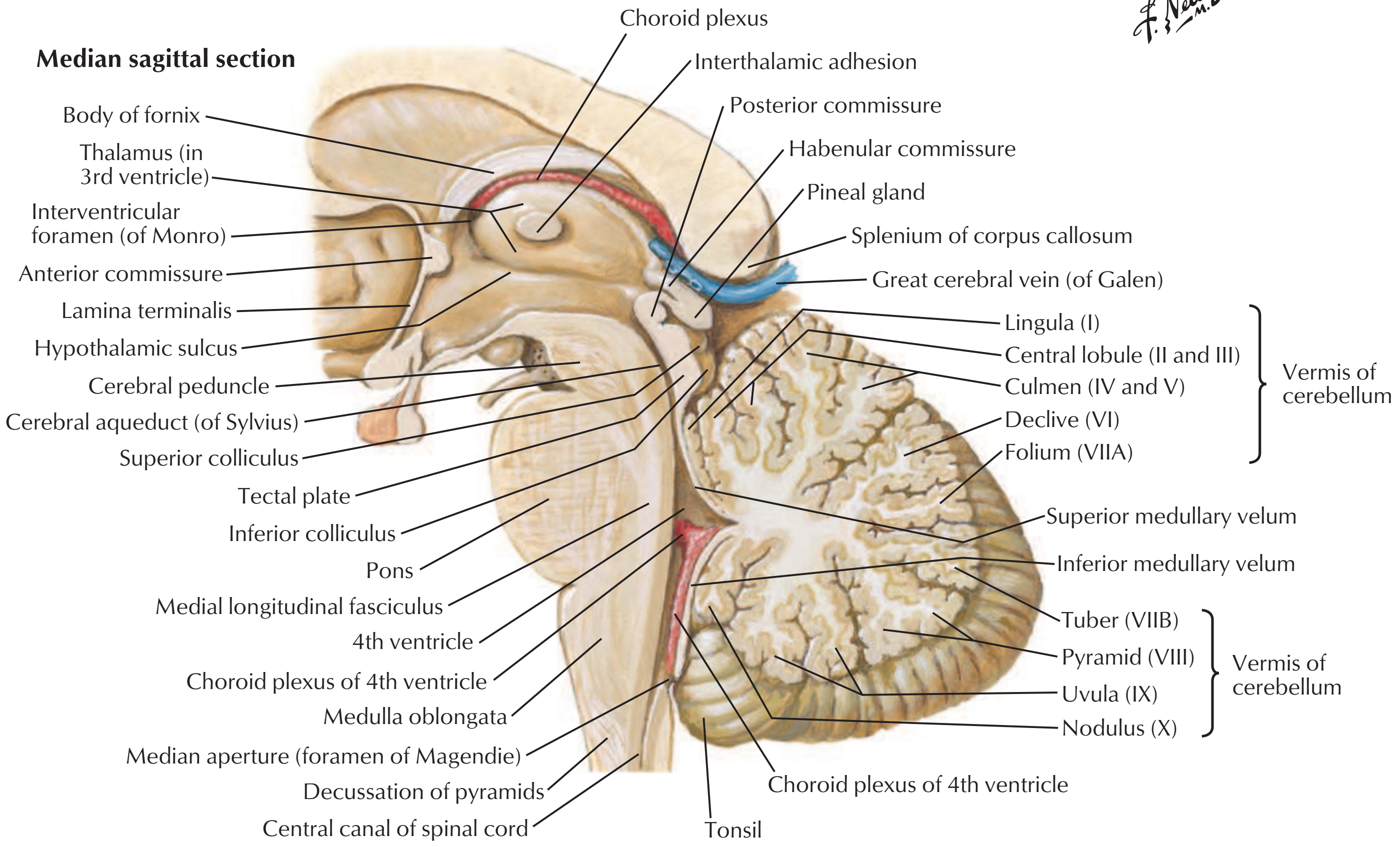


Anterior view

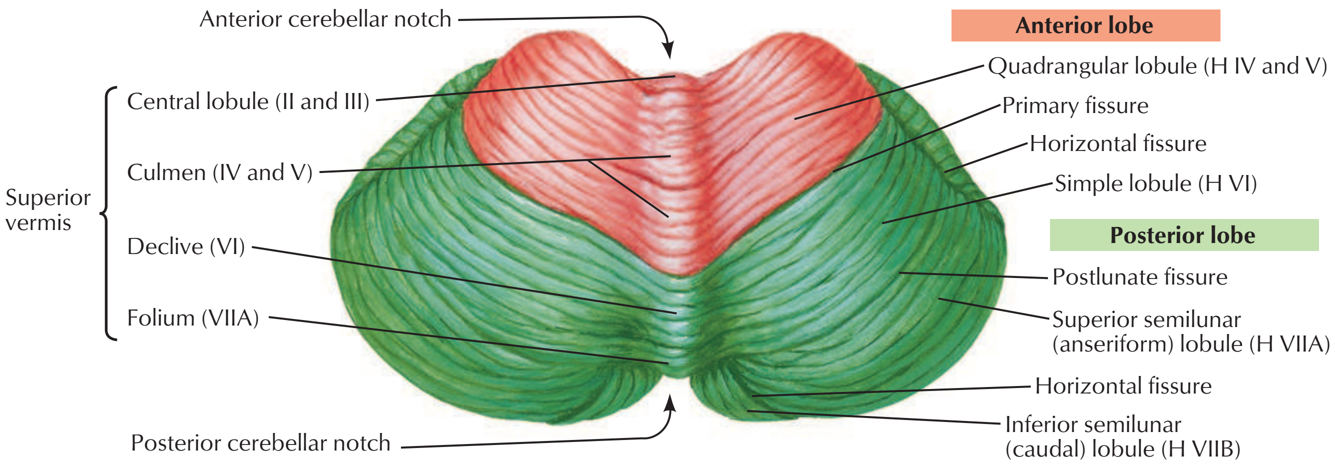
Optic chiasm
Optic tract
Tuber cinereum
Cerebral crus
Lateral geniculate body
Posterior perforated substance
Pons
Middle cerebellar peduncle
Olive
Pyramids
Anterior rootlets of 1st spinal nerve (C1)
Decussation of pyramids
Olfactory tract
Anterior perforated substance
Infundibulum
Mammillary bodies
Temporal lobe (*cut surface*)
Oculomotor nerve (CN III)
Trochlear nerve (CN IV)
Trigeminal nerve (CN V) (sensory and motor roots)
Abducens nerve (CN VI)
Facial nerve (CN VII) and intermediate nerve (of Wrisberg)
Vestibulocochlear nerve (CN VIII)
Flocculus of cerebellum
Choroid plexus of 4th ventricle extending out of lateral aperture
Glossopharyngeal nerve (CN IX)
Vagus nerve (CN X)
Hypoglossal nerve (CN XII)
Accessory nerve (CN XI)

Ventricles and Cerebellum

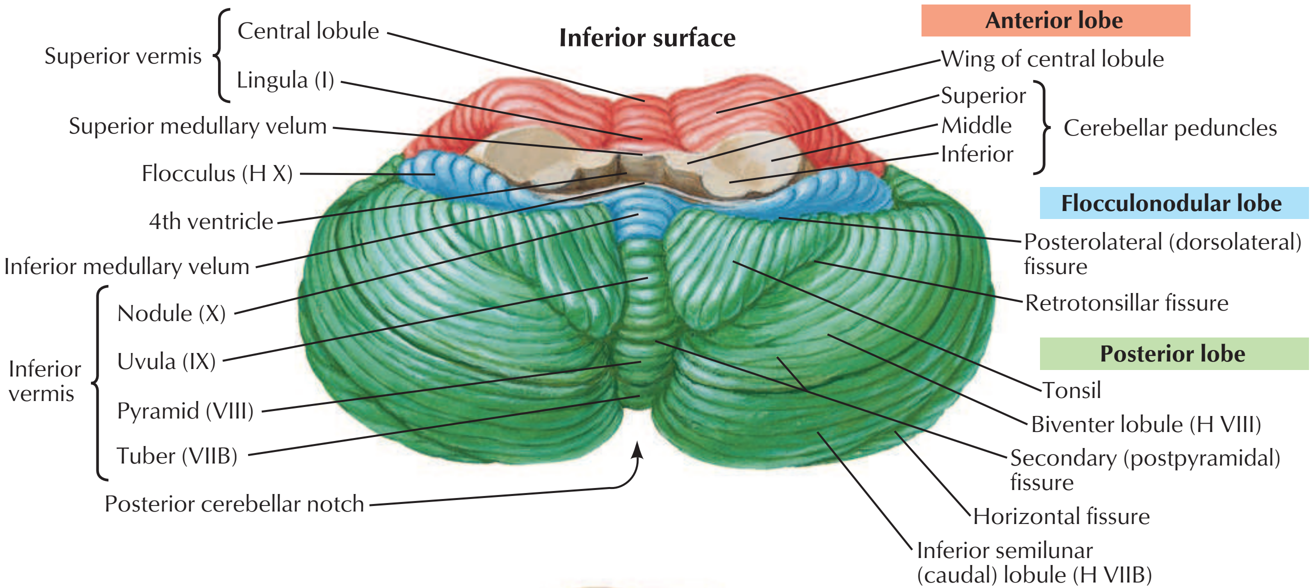

Posterior view
Habenular trigone
3rd ventricle
Medial
Lateral
Geniculate bodies
Pulvinar
Posterior median sulcus
Pineal gland
Superior cerebellar peduncle
Superior colliculus
Locus coeruleus
Inferior colliculus
Medial eminence
Trochlear nerve (CN IV)
Facial colliculus
Superior medullary velum
Vestibular area
Cerebellar peduncles
Superior
Middle
Inferior
Dentate nucleus
Striae medullares
Lateral recess
Taenia of 4th ventricle
Superior fovea
Cuneate tubercle
Sulcus limitans
Gracile tubercle
Inferior fovea
Posterior median sulcus
Trigeminal tubercle
Lateral funiculus
Hypoglossal trigone
Cuneate fasciculus
Vagal trigone
Gracile fasciculus
Obex

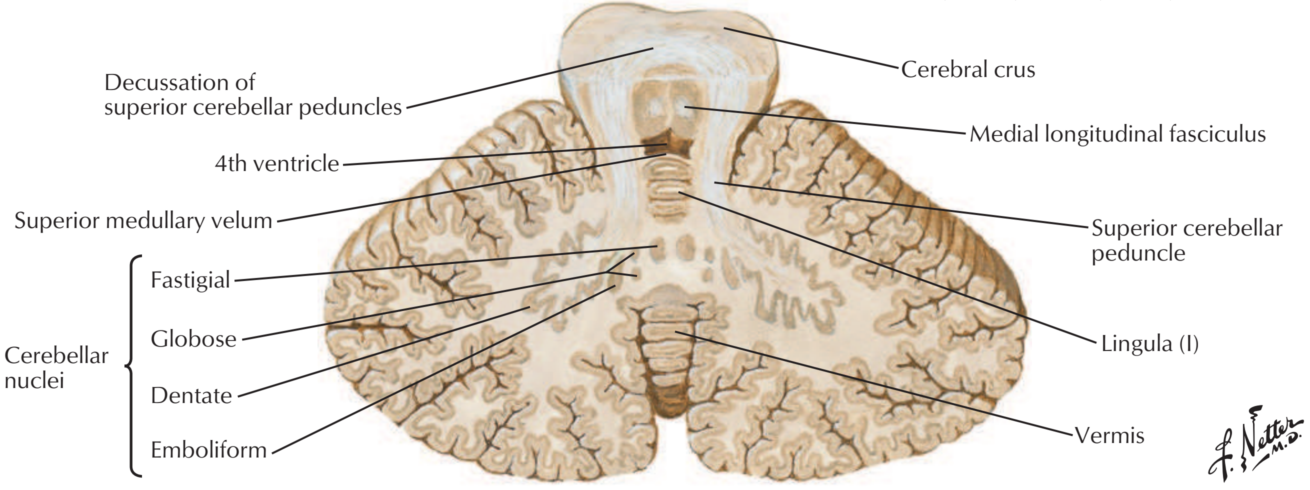

Median sagittal section
Choroid plexus
Interthalamic adhesion
Posterior commissure
Body of fornix
Habenular commissure
Thalamus (in 3rd ventricle)
Pineal gland
Interventricular foramen (of Monro)
Splenium of corpus callosum
Anterior commissure
Great cerebral vein (of Galen)
Lamina terminalis
Lingula (I)
Hypothalamic sulcus
Central lobule (II and III)
Cerebral peduncle
Culmen (IV and V)
Vermis of cerebellum
Cerebral aqueduct (of Sylvius)
Declive (VI)
Superior colliculus
Folium (VIIA)
Tectal plate
Superior medullary velum
Inferior colliculus
Inferior medullary velum
Pons
Medial longitudinal fasciculus
Tuber (VIIB)
4th ventricle
Pyramid (VIII)
Vermis of cerebellum
Choroid plexus of 4th ventricle
Uvula (IX)
Medulla oblongata
Nodulus (X)
Median aperture (foramen of Magendie)
Choroid plexus of 4th ventricle
Decussation of pyramids
Central canal of spinal cord
Tonsil

Superior surface


Anterior cerebellar notch
Anterior lobe
Quadrangular lobule (H IV and V)
Primary fissure
Horizontal fissure
Simple lobule (H VI)
Superior vermis
Central lobule (II and III)
Culmen (IV and V)
Declive (VI)
Folium (VIIA)
Posterior lobe
Postlunate fissure
Superior semilunar (anseriform) lobule (H VIIA)
Horizontal fissure
Inferior semilunar (caudal) lobule (H VIIB)
Posterior cerebellar notch

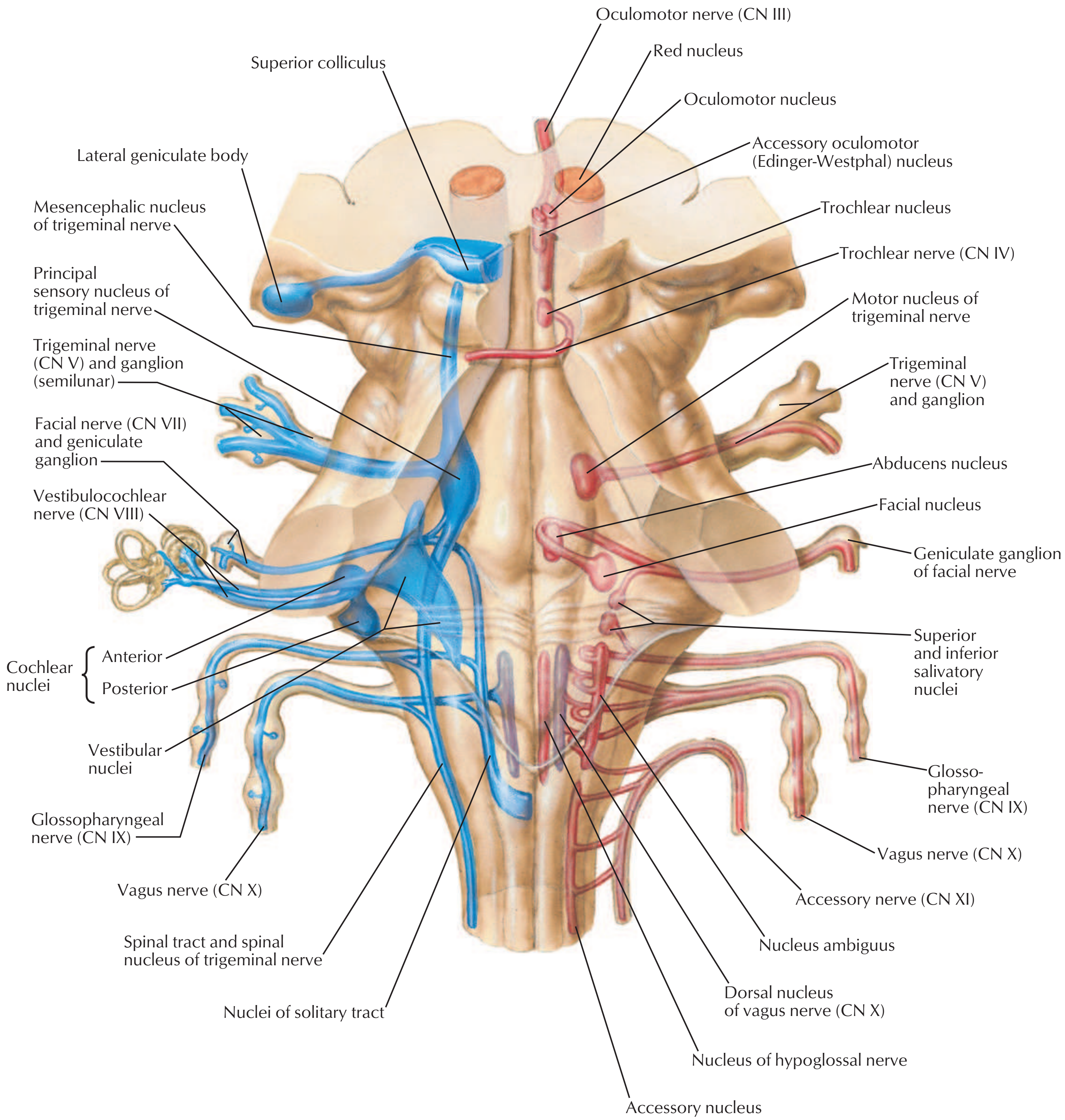
Inferior surface


Superior vermis
Central lobule
Lingula (I)
Anterior lobe
Wing of central lobule
Superior
Middle
Inferior
Cerebellar peduncles
Superior medullary velum
Flocculus (H X)
4th ventricle
Inferior medullary velum
Flocculonodular lobe
Posterolateral (dorsolateral) fissure
Retrotonsillar fissure
Inferior vermis
Nodule (X)
Uvula (IX)
Pyramid (VIII)
Tuber (VIIB)
Posterior lobe
Tonsil
Biventer lobule (H VIII)
Secondary (postpyramidal) fissure
Horizontal fissure
Posterior cerebellar notch
Inferior semilunar (caudal) lobule (H VIIB)

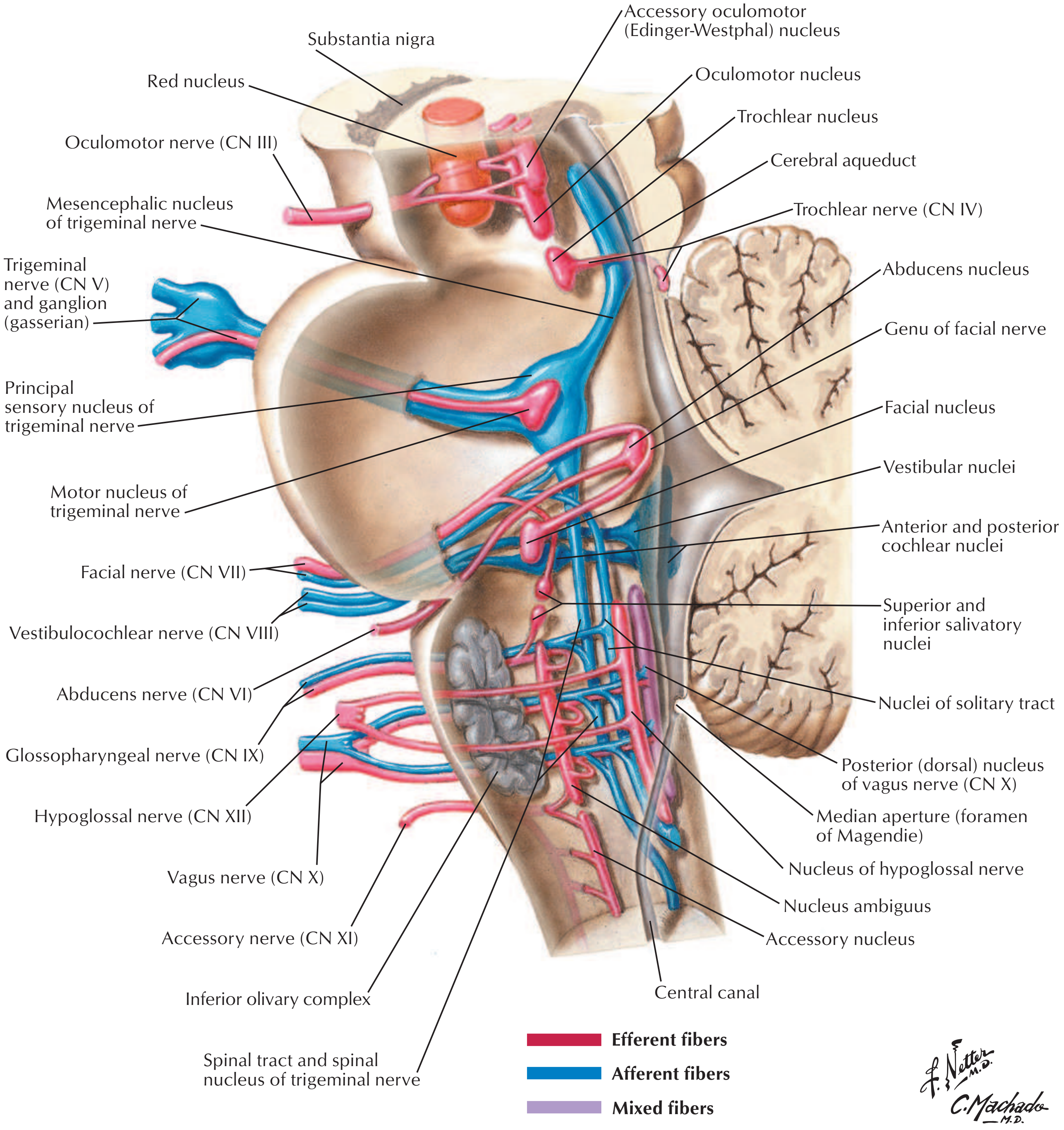

Cerebral crus
Decussation of superior cerebellar peduncles
Medial longitudinal fasciculus
4th ventricle
Superior medullary velum
Superior cerebellar peduncle
Cerebellar nuclei
Fastigial
Globose
Dentate
Emboliform
Lingula (I)
Vermis

Section in plane of superior cerebellar peduncle

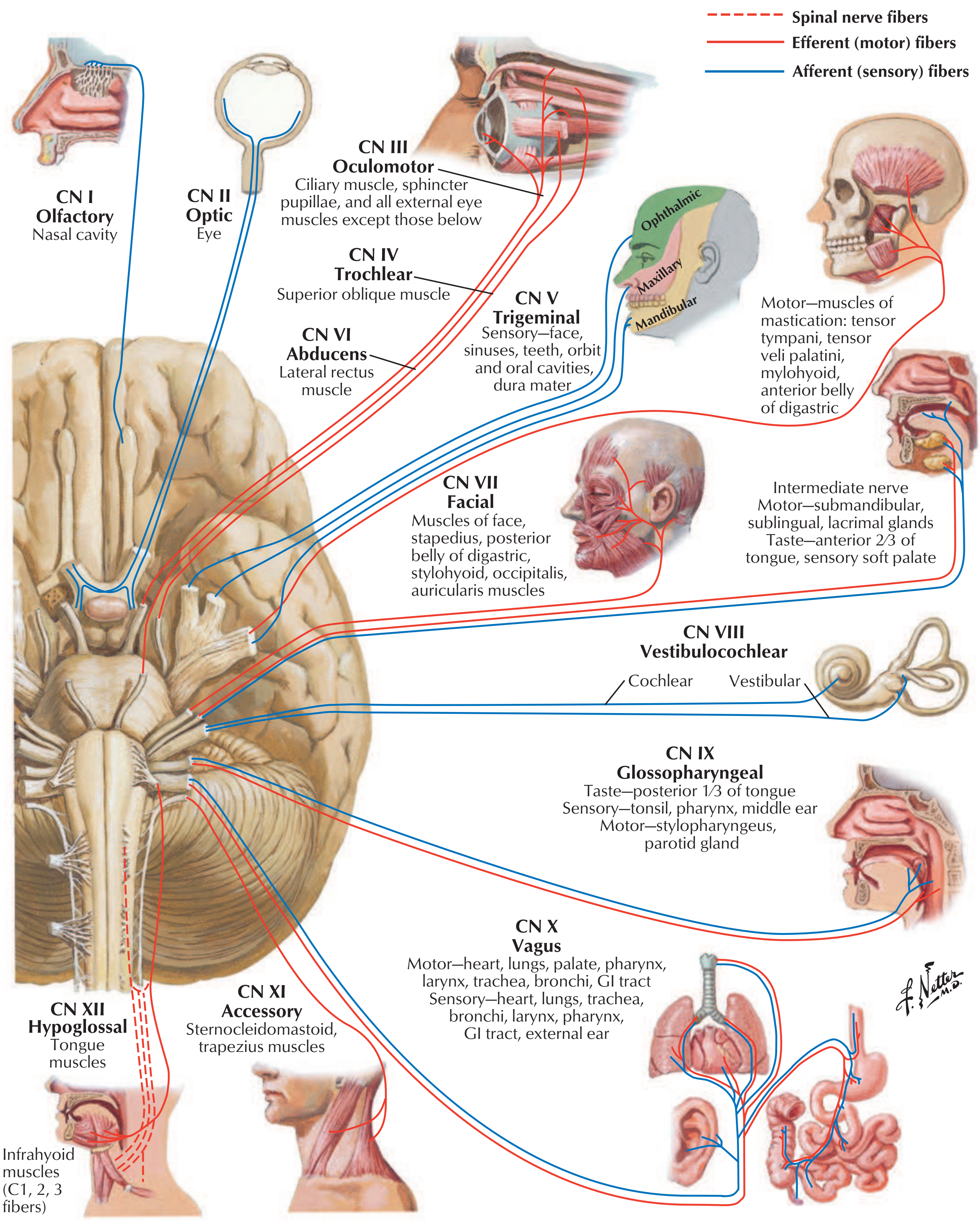
Cranial Nerve Nuclei in Brain Stem: Schema


Oculomotor nerve (CN III)
Red nucleus
Superior colliculus
Oculomotor nucleus
Accessory oculomotor (Edinger-Westphal) nucleus
Lateral geniculate body
Mesencephalic nucleus of trigeminal nerve
Trochlear nucleus
Trochlear nerve (CN IV)
Principal sensory nucleus of trigeminal nerve
Motor nucleus of trigeminal nerve
Trigeminal nerve (CN V) and ganglion (semilunar)
Trigeminal nerve (CN V) and ganglion
Facial nerve (CN VII) and geniculate ganglion
Abducens nucleus
Vestibulocochlear nerve (CN VIII)
Facial nucleus
Geniculate ganglion of facial nerve
Cochlear nuclei
Anterior
Posterior
Superior and inferior salivatory nuclei
Vestibular nuclei
Glossopharyngeal nerve (CN IX)
Glosso-pharyngeal nerve (CN IX)
Vagus nerve (CN X)
Vagus nerve (CN X)
Accessory nerve (CN XI)
Spinal tract and spinal nucleus of trigeminal nerve
Nucleus ambiguus
Nuclei of solitary tract
Dorsal nucleus of vagus nerve (CN X)
Nucleus of hypoglossal nerve
Accessory nucleus

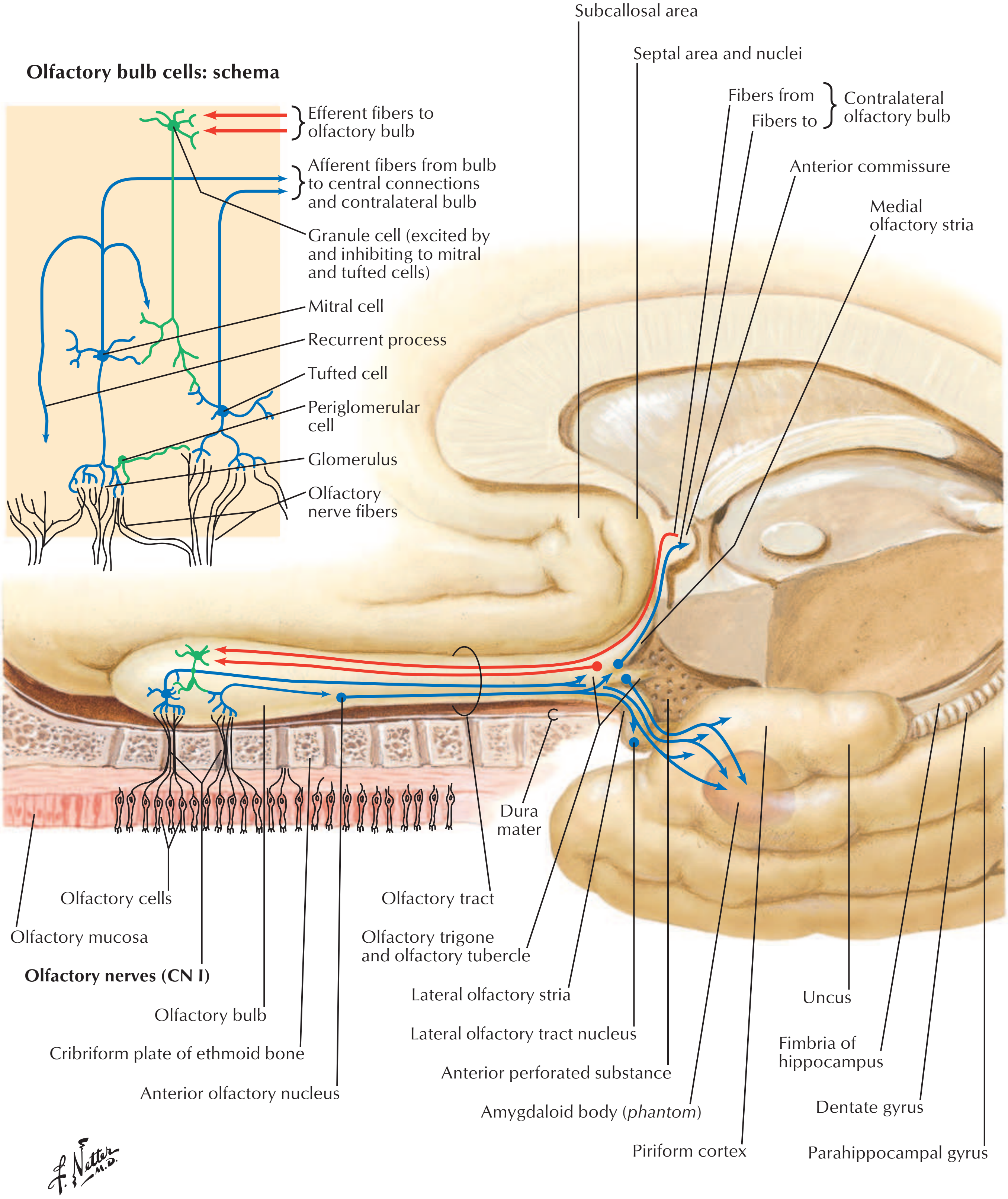
🟥 **Efferent fibers**
🟦 **Afferent fibers**
🟪 **Mixed fibers**


Substantia nigra
Accessory oculomotor (Edinger-Westphal) nucleus
Red nucleus
Oculomotor nucleus
Trochlear nucleus
Oculomotor nerve (CN III)
Cerebral aqueduct
Mesencephalic nucleus of trigeminal nerve
Trochlear nerve (CN IV)
Trigeminal nerve (CN V) and ganglion (gasserian)
Abducens nucleus
Genu of facial nerve
Principal sensory nucleus of trigeminal nerve
Facial nucleus
Motor nucleus of trigeminal nerve
Vestibular nuclei
Anterior and posterior cochlear nuclei
Facial nerve (CN VII)
Superior and inferior salivatory nuclei
Vestibulocochlear nerve (CN VIII)
Abducens nerve (CN VI)
Nuclei of solitary tract
Glossopharyngeal nerve (CN IX)
Posterior (dorsal) nucleus of vagus nerve (CN X)
Hypoglossal nerve (CN XII)
Median aperture (foramen of Magendie)
Nucleus of hypoglossal nerve
Vagus nerve (CN X)
Nucleus ambiguus
Accessory nerve (CN XI)
Accessory nucleus
Central canal
Inferior olivary complex
Spinal tract and spinal nucleus of trigeminal nerve
Efferent fibers
Afferent fibers
Mixed fibers
F. Netter M.D.
C. Machado M.D.

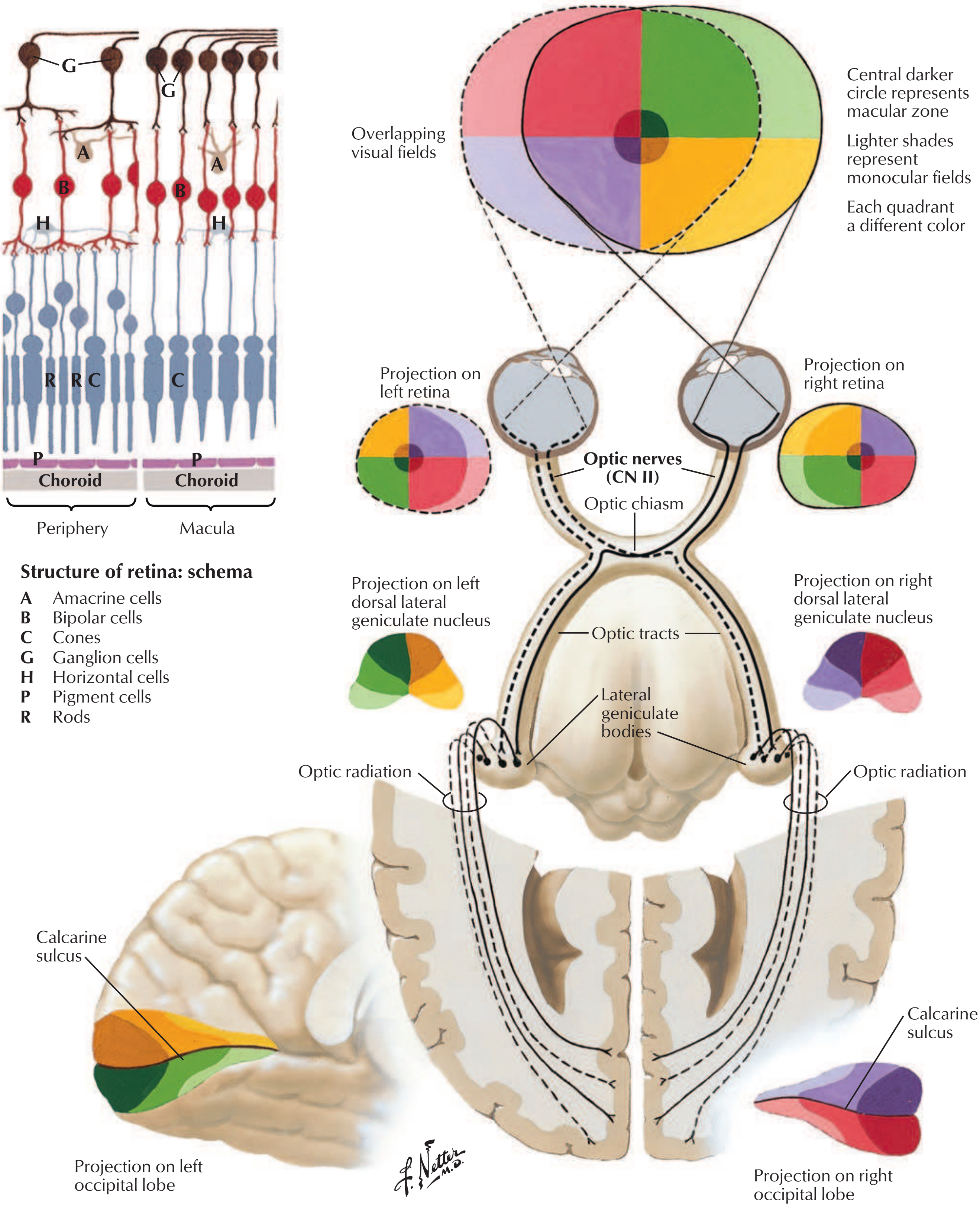
Cranial Nerves (Motor and Sensory Distribution): Schema


Spinal nerve fibers
Efferent (motor) fibers
Afferent (sensory) fibers
CN I
Olfactory
Nasal cavity
CN II
Optic
Eye
CN III
Oculomotor
Ciliary muscle, sphincter pupillae, and all external eye muscles except those below
CN IV
Trochlear
Superior oblique muscle
CN VI
Abducens
Lateral rectus muscle
CN V
Trigeminal
Sensory—face, sinuses, teeth, orbit and oral cavities, dura mater
Ophthalmic
Maxillary
Mandibular
Motor—muscles of mastication: tensor tympani, tensor veli palatini, mylohyoid, anterior belly of digastric
CN VII
Facial
Muscles of face, stapedius, posterior belly of digastric, stylohyoid, occipitalis, auricularis muscles
Intermediate nerve
Motor—submandibular, sublingual, lacrimal glands
Taste—anterior 2⁄3 of tongue, sensory soft palate
CN VIII
Vestibulocochlear
Cochlear
Vestibular
CN IX
Glossopharyngeal
Taste—posterior 1⁄3 of tongue
Sensory—tonsil, pharynx, middle ear
Motor—stylopharyngeus, parotid gland
CN X
Vagus
Motor—heart, lungs, palate, pharynx, larynx, trachea, bronchi, GI tract
Sensory—heart, lungs, trachea, bronchi, larynx, pharynx, GI tract, external ear
CN XI
Accessory
Sternocleidomastoid, trapezius muscles
CN XII
Hypoglossal
Tongue muscles
Infrahyoid muscles (C1, 2, 3 fibers)

See also Plate 46


Olfactory bulb cells: schema
Efferent fibers to olfactory bulb
Afferent fibers from bulb to central connections and contralateral bulb
Granule cell (excited by and inhibiting to mitral and tufted cells)
Mitral cell
Recurrent process
Tufted cell
Periglomerular cell
Glomerulus
Olfactory nerve fibers
Subcallosal area
Septal area and nuclei
Fibers from
Fibers to
Contralateral olfactory bulb
Anterior commissure
Medial olfactory stria
Dura mater
Olfactory cells
Olfactory mucosa
Olfactory nerves (CN I)
Olfactory bulb
Cribriform plate of ethmoid bone
Anterior olfactory nucleus
Olfactory tract
Olfactory trigone and olfactory tubercle
Lateral olfactory stria
Lateral olfactory tract nucleus
Anterior perforated substance
Amygdaloid body (phantom)
Piriform cortex
Uncus
Fimbria of hippocampus
Dentate gyrus
Parahippocampal gyrus
F. Netter M.D.

Optic Nerve (CN II) (Visual Pathway): Schema

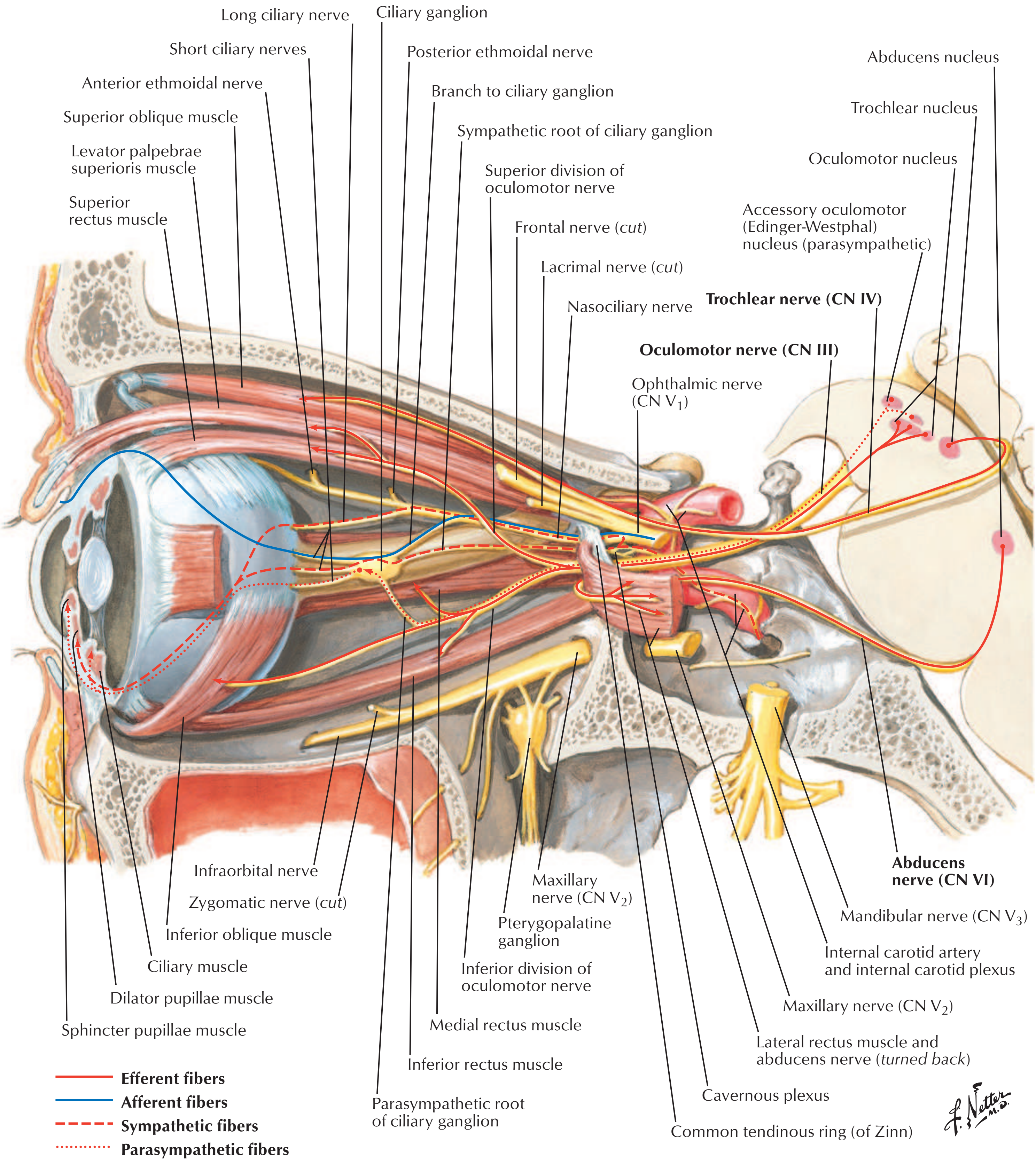

G
G
A
A
B
B
H
H
R
R
C
C
P
P
Choroid
Choroid
Periphery
Macula
Overlapping visual fields
Central darker circle represents macular zone
Lighter shades represent monocular fields
Each quadrant a different color
Projection on left retina
Projection on right retina
Optic nerves (CN II)
Optic chiasm
Projection on left dorsal lateral geniculate nucleus
Projection on right dorsal lateral geniculate nucleus
Optic tracts
Lateral geniculate bodies
Optic radiation
Optic radiation
Calcarine sulcus
Calcarine sulcus
Projection on left occipital lobe
Projection on right occipital lobe

Structure of retina: schema

A	Amacrine cells
B	Bipolar cells
C	Cones
G	Ganglion cells
H	Horizontal cells
P	Pigment cells
R	Rods

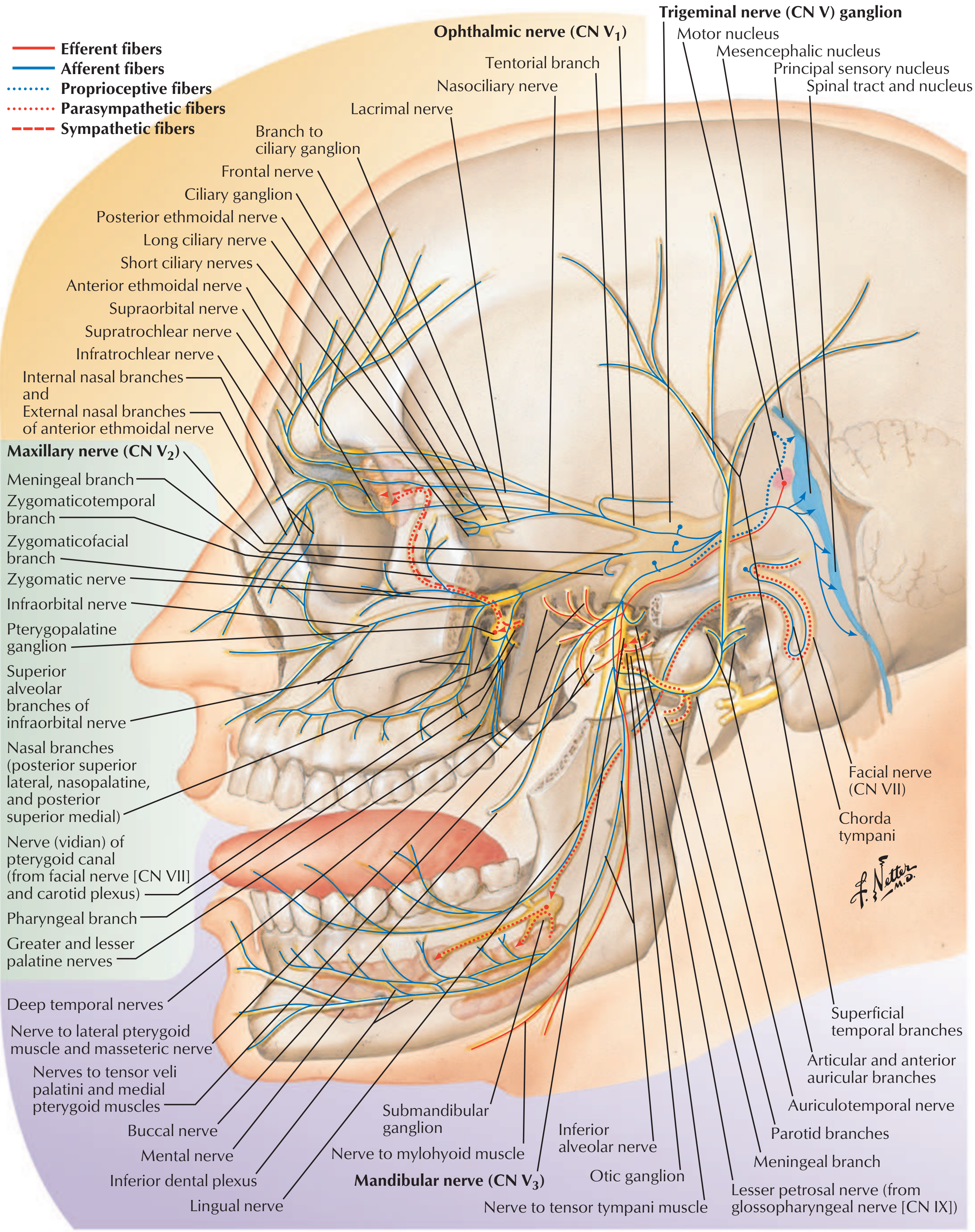
Oculomotor (CN III), Trochlear (CN IV), and Abducens (CN VI) Nerves: Schema

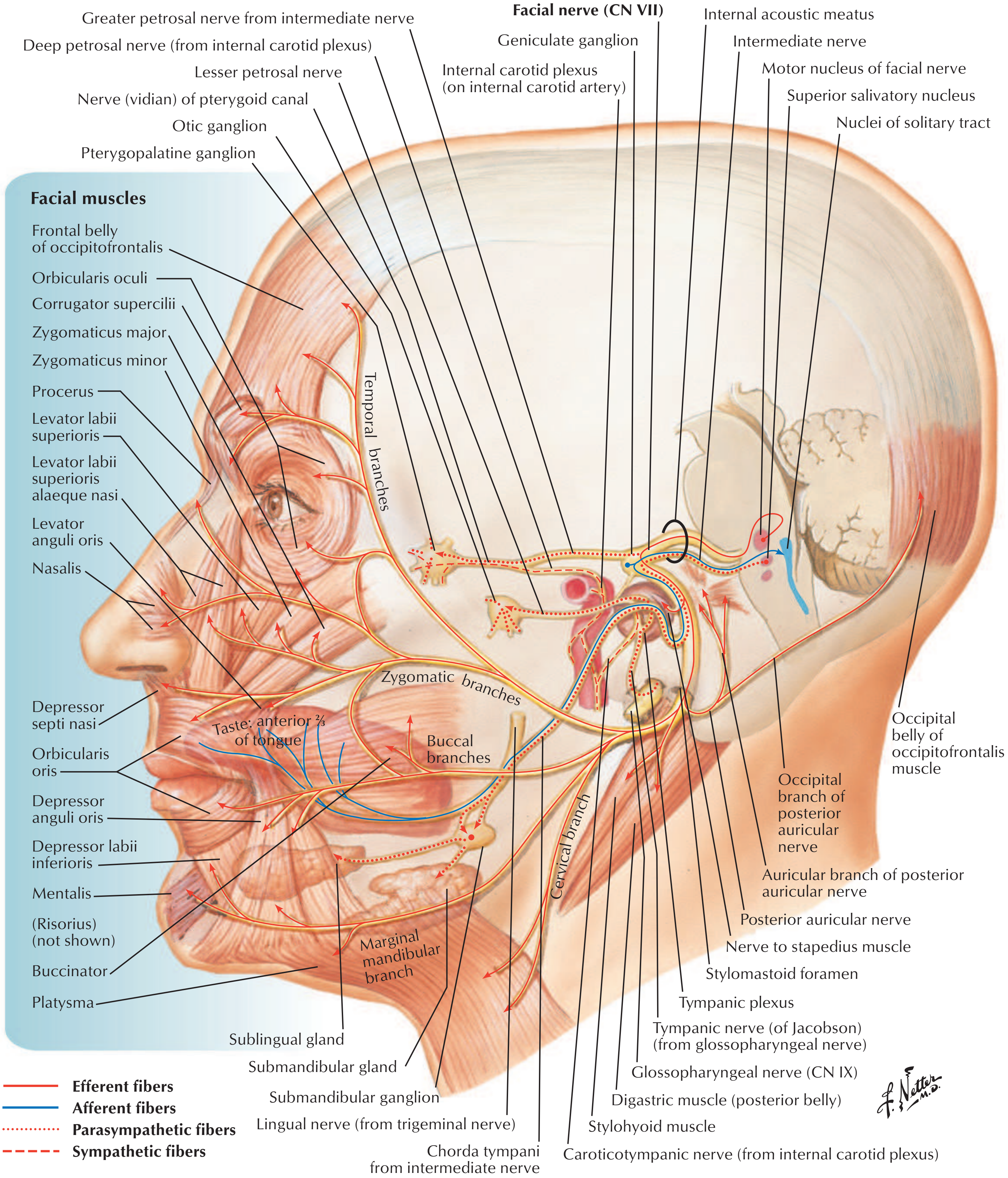
See also Plates 97, 143

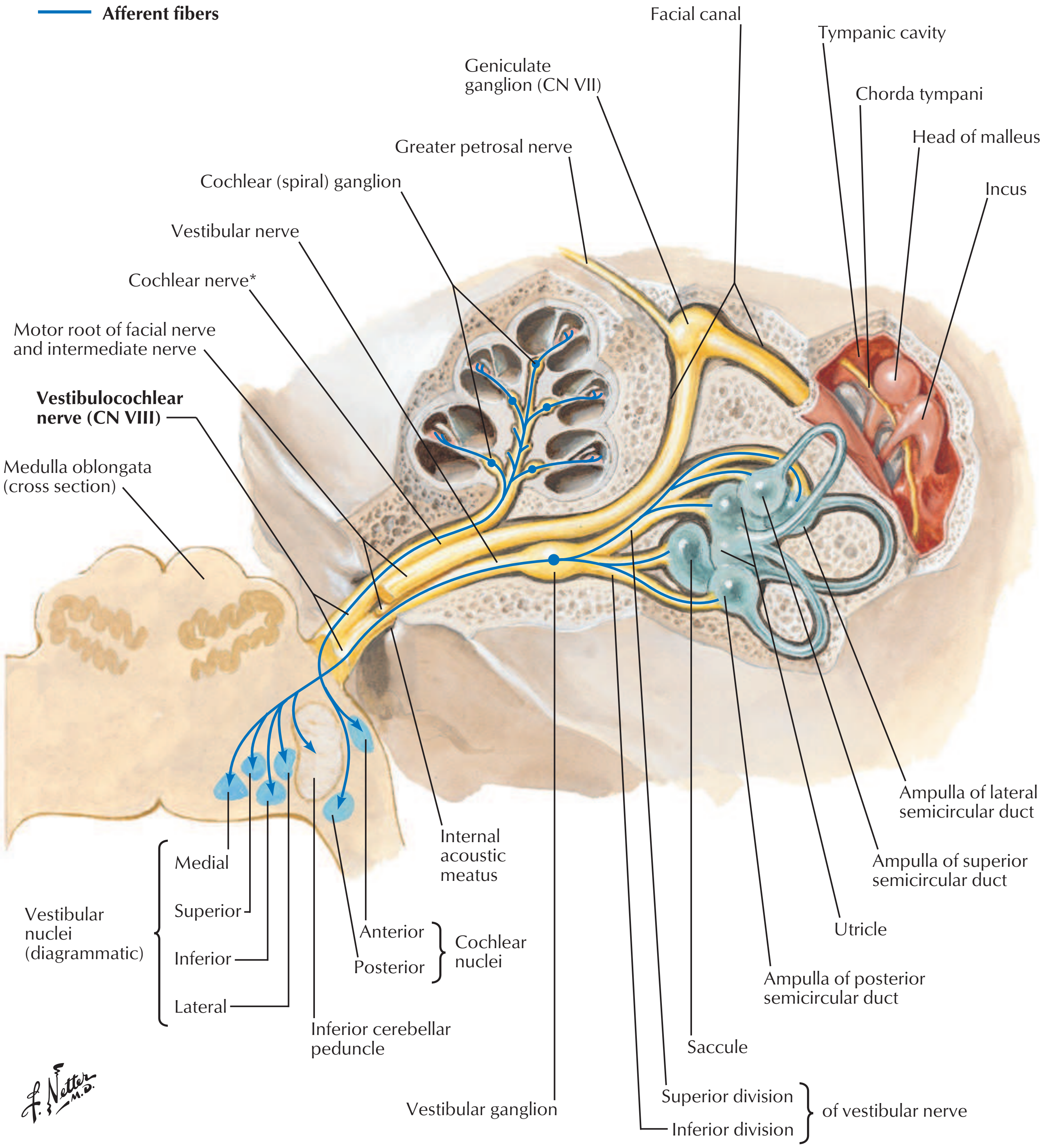

Long ciliary nerve
Ciliary ganglion
Short ciliary nerves
Posterior ethmoidal nerve
Anterior ethmoidal nerve
Branch to ciliary ganglion
Superior oblique muscle
Sympathetic root of ciliary ganglion
Levator palpebrae superioris muscle
Superior division of oculomotor nerve
Superior rectus muscle
Frontal nerve (*cut*)
Lacrimal nerve (*cut*)
Nasociliary nerve
Abducens nucleus
Trochlear nucleus
Oculomotor nucleus
Accessory oculomotor (Edinger-Westphal) nucleus (parasympathetic)
Trochlear nerve (CN IV)
Oculomotor nerve (CN III)
Ophthalmic nerve (CN V$_1$)
Infraorbital nerve
Zygomatic nerve (*cut*)
Inferior oblique muscle
Ciliary muscle
Dilator pupillae muscle
Sphincter pupillae muscle
Maxillary nerve (CN V$_2$)
Pterygopalatine ganglion
Inferior division of oculomotor nerve
Medial rectus muscle
Inferior rectus muscle
Parasympathetic root of ciliary ganglion
Abducens nerve (CN VI)
Mandibular nerve (CN V$_3$)
Internal carotid artery and internal carotid plexus
Maxillary nerve (CN V$_2$)
Lateral rectus muscle and abducens nerve (*turned back*)
Cavernous plexus
Common tendinous ring (of Zinn)
Efferent fibers
Afferent fibers
Sympathetic fibers
Parasympathetic fibers

Trigeminal Nerve (CN V): Schema

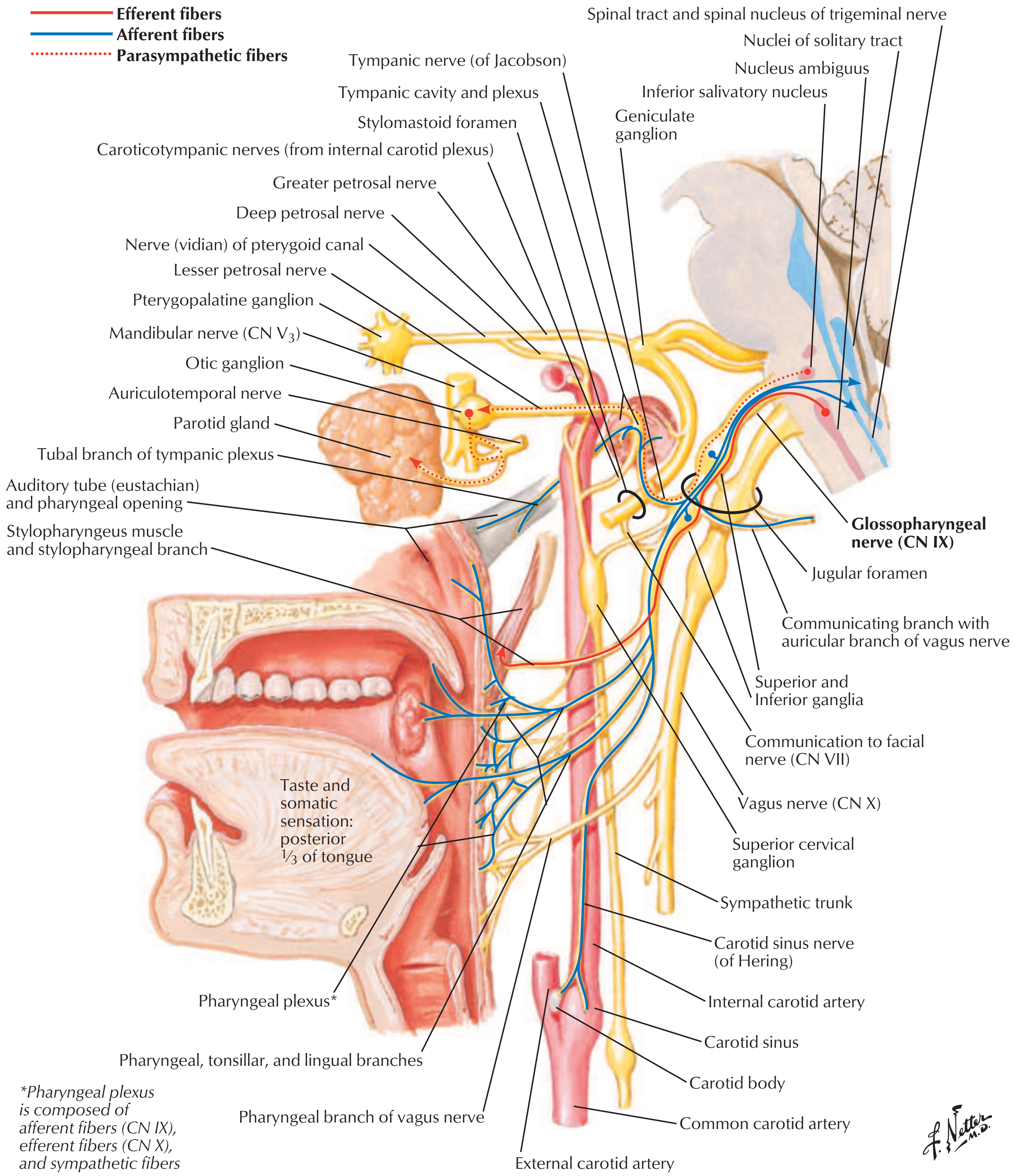
See also Plates 9, 59, 61


Efferent fibers
Afferent fibers
Proprioceptive fibers
Parasympathetic fibers
Sympathetic fibers
Ophthalmic nerve (CN V1)
Tentorial branch
Nasociliary nerve
Lacrimal nerve
Branch to ciliary ganglion
Frontal nerve
Ciliary ganglion
Posterior ethmoidal nerve
Long ciliary nerve
Short ciliary nerves
Anterior ethmoidal nerve
Supraorbital nerve
Supratrochlear nerve
Infratrochlear nerve
Internal nasal branches and External nasal branches of anterior ethmoidal nerve
Trigeminal nerve (CN V) ganglion
Motor nucleus
Mesencephalic nucleus
Principal sensory nucleus
Spinal tract and nucleus
Maxillary nerve (CN V2)
Meningeal branch
Zygomaticotemporal branch
Zygomaticofacial branch
Zygomatic nerve
Infraorbital nerve
Pterygopalatine ganglion
Superior alveolar branches of infraorbital nerve
Nasal branches (posterior superior lateral, nasopalatine, and posterior superior medial)
Nerve (vidian) of pterygoid canal (from facial nerve [CN VII] and carotid plexus)
Pharyngeal branch
Greater and lesser palatine nerves
Facial nerve (CN VII)
Chorda tympani
Deep temporal nerves
Nerve to lateral pterygoid muscle and masseteric nerve
Nerves to tensor veli palatini and medial pterygoid muscles
Buccal nerve
Mental nerve
Inferior dental plexus
Lingual nerve
Submandibular ganglion
Nerve to mylohyoid muscle
Mandibular nerve (CN V3)
Inferior alveolar nerve
Otic ganglion
Nerve to tensor tympani muscle
Superficial temporal branches
Articular and anterior auricular branches
Auriculotemporal nerve
Parotid branches
Meningeal branch
Lesser petrosal nerve (from glossopharyngeal nerve [CN IX])
F. Netter M.D.


Greater petrosal nerve from intermediate nerve
Deep petrosal nerve (from internal carotid plexus)
Lesser petrosal nerve
Nerve (vidian) of pterygoid canal
Otic ganglion
Pterygopalatine ganglion
Facial nerve (CN VII)
Geniculate ganglion
Internal carotid plexus (on internal carotid artery)
Internal acoustic meatus
Intermediate nerve
Motor nucleus of facial nerve
Superior salivatory nucleus
Nuclei of solitary tract
Facial muscles
Frontal belly of occipitofrontalis
Orbicularis oculi
Corrugator supercilii
Zygomaticus major
Zygomaticus minor
Procerus
Levator labii superioris
Levator labii superioris alaeque nasi
Levator anguli oris
Nasalis
Depressor septi nasi
Orbicularis oris
Depressor anguli oris
Depressor labii inferioris
Mentalis
(Risorius) (not shown)
Buccinator
Platysma
Temporal branches
Zygomatic branches
Taste: anterior ⅔ of tongue
Buccal branches
Marginal mandibular branch
Cervical branch
Occipital belly of occipitofrontalis muscle
Occipital branch of posterior auricular nerve
Auricular branch of posterior auricular nerve
Posterior auricular nerve
Nerve to stapedius muscle
Stylomastoid foramen
Tympanic plexus
Tympanic nerve (of Jacobson) (from glossopharyngeal nerve)
Glossopharyngeal nerve (CN IX)
Digastric muscle (posterior belly)
Stylohyoid muscle
Caroticotympanic nerve (from internal carotid plexus)
Chorda tympani from intermediate nerve
Lingual nerve (from trigeminal nerve)
Submandibular ganglion
Submandibular gland
Sublingual gland
Efferent fibers
Afferent fibers
Parasympathetic fibers
Sympathetic fibers

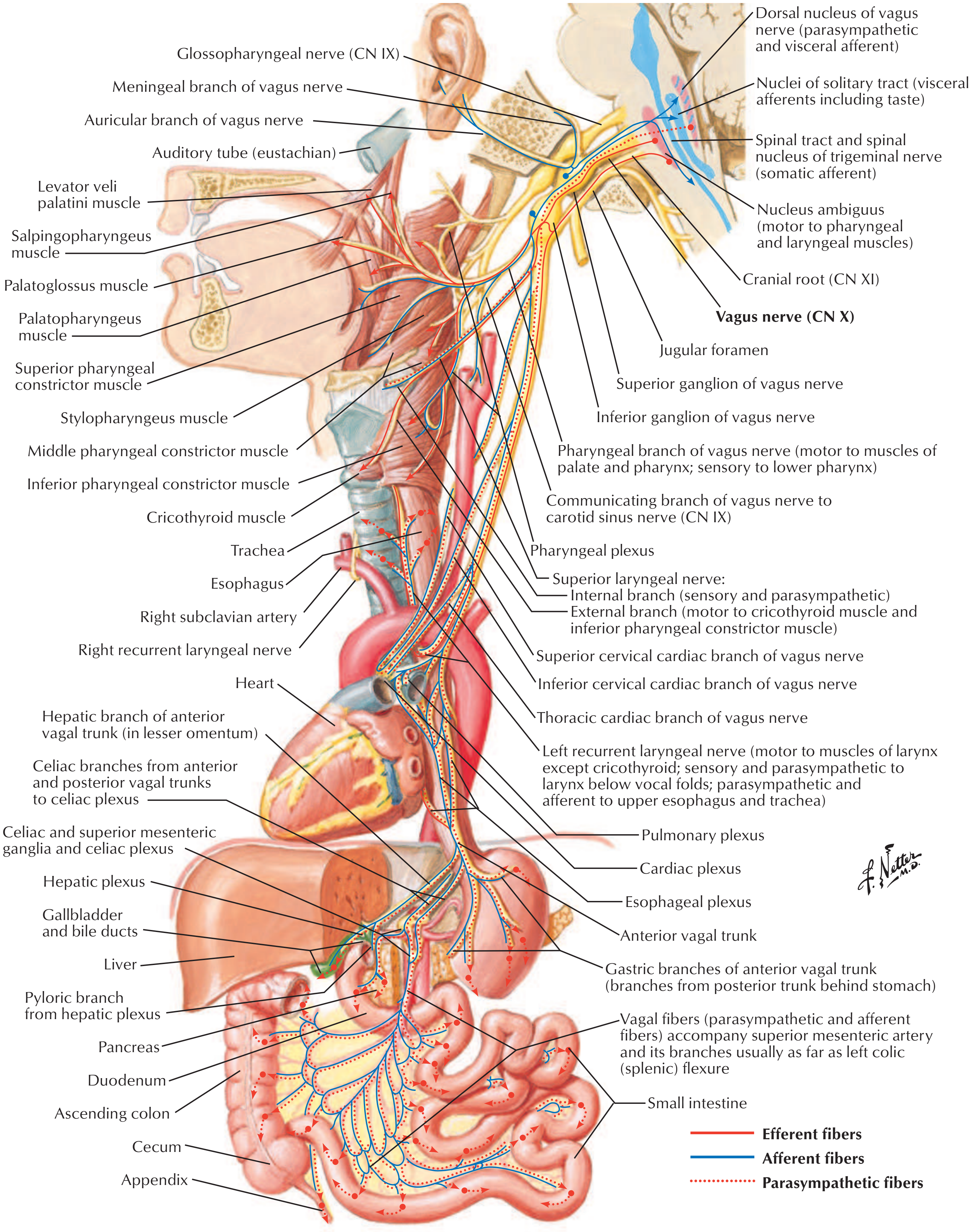

Afferent fibers
Facial canal
Tympanic cavity
Geniculate ganglion (CN VII)
Chorda tympani
Head of malleus
Greater petrosal nerve
Cochlear (spiral) ganglion
Incus
Vestibular nerve
Cochlear nerve*
Motor root of facial nerve and intermediate nerve
Vestibulocochlear nerve (CN VIII)
Medulla oblongata (cross section)
Ampulla of lateral semicircular duct
Ampulla of superior semicircular duct
Internal acoustic meatus
Medial
Vestibular nuclei (diagrammatic)
Superior
Inferior
Lateral
Anterior
Posterior
Cochlear nuclei
Utricle
Ampulla of posterior semicircular duct
Inferior cerebellar peduncle
Saccule
Vestibular ganglion
Superior division
Inferior division
of vestibular nerve

**Note: The cochlear nerve also contains efferent fibers to the sensory epithelium. These fibers are derived from the vestibular nerve while in the internal acoustic meatus.*

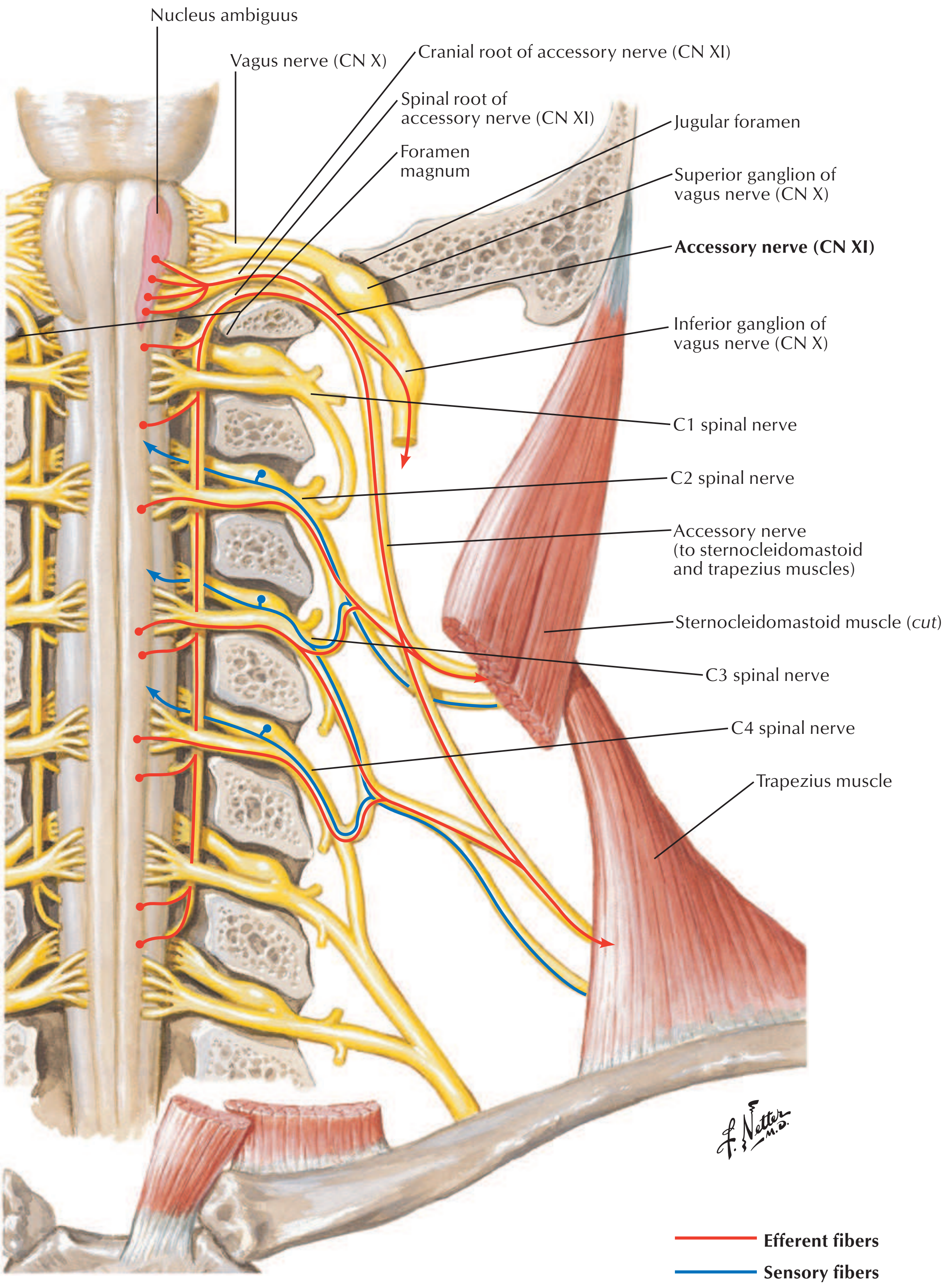

Efferent fibers
Afferent fibers
Parasympathetic fibers
Spinal tract and spinal nucleus of trigeminal nerve
Nuclei of solitary tract
Nucleus ambiguus
Inferior salivatory nucleus
Geniculate ganglion
Tympanic nerve (of Jacobson)
Tympanic cavity and plexus
Stylomastoid foramen
Caroticotympanic nerves (from internal carotid plexus)
Greater petrosal nerve
Deep petrosal nerve
Nerve (vidian) of pterygoid canal
Lesser petrosal nerve
Pterygopalatine ganglion
Mandibular nerve (CN V_3)
Otic ganglion
Auriculotemporal nerve
Parotid gland
Tubal branch of tympanic plexus
Auditory tube (eustachian) and pharyngeal opening
Stylopharyngeus muscle and stylopharyngeal branch
Glossopharyngeal nerve (CN IX)
Jugular foramen
Communicating branch with auricular branch of vagus nerve
Superior and Inferior ganglia
Communication to facial nerve (CN VII)
Vagus nerve (CN X)
Superior cervical ganglion
Sympathetic trunk
Carotid sinus nerve (of Hering)
Internal carotid artery
Carotid sinus
Carotid body
Common carotid artery
External carotid artery
Taste and somatic sensation: posterior ⅓ of tongue
Pharyngeal plexus*
Pharyngeal, tonsillar, and lingual branches
Pharyngeal branch of vagus nerve
F. Netter M.D.

*Pharyngeal plexus is composed of afferent fibers (CN IX), efferent fibers (CN X), and sympathetic fibers

Vagus Nerve (CN X): Schema


Glossopharyngeal nerve (CN IX)
Meningeal branch of vagus nerve
Auricular branch of vagus nerve
Auditory tube (eustachian)
Levator veli palatini muscle
Salpingopharyngeus muscle
Palatoglossus muscle
Palatopharyngeus muscle
Superior pharyngeal constrictor muscle
Stylopharyngeus muscle
Middle pharyngeal constrictor muscle
Inferior pharyngeal constrictor muscle
Cricothyroid muscle
Trachea
Esophagus
Right subclavian artery
Right recurrent laryngeal nerve
Heart
Hepatic branch of anterior vagal trunk (in lesser omentum)
Celiac branches from anterior and posterior vagal trunks to celiac plexus
Celiac and superior mesenteric ganglia and celiac plexus
Hepatic plexus
Gallbladder and bile ducts
Liver
Pyloric branch from hepatic plexus
Pancreas
Duodenum
Ascending colon
Cecum
Appendix
Dorsal nucleus of vagus nerve (parasympathetic and visceral afferent)
Nuclei of solitary tract (visceral afferents including taste)
Spinal tract and spinal nucleus of trigeminal nerve (somatic afferent)
Nucleus ambiguus (motor to pharyngeal and laryngeal muscles)
Cranial root (CN XI)
Vagus nerve (CN X)
Jugular foramen
Superior ganglion of vagus nerve
Inferior ganglion of vagus nerve
Pharyngeal branch of vagus nerve (motor to muscles of palate and pharynx; sensory to lower pharynx)
Communicating branch of vagus nerve to carotid sinus nerve (CN IX)
Pharyngeal plexus
Superior laryngeal nerve:
Internal branch (sensory and parasympathetic)
External branch (motor to cricothyroid muscle and inferior pharyngeal constrictor muscle)
Superior cervical cardiac branch of vagus nerve
Inferior cervical cardiac branch of vagus nerve
Thoracic cardiac branch of vagus nerve
Left recurrent laryngeal nerve (motor to muscles of larynx except cricothyroid; sensory and parasympathetic to larynx below vocal folds; parasympathetic and afferent to upper esophagus and trachea)
Pulmonary plexus
Cardiac plexus
Esophageal plexus
Anterior vagal trunk
Gastric branches of anterior vagal trunk (branches from posterior trunk behind stomach)
Vagal fibers (parasympathetic and afferent fibers) accompany superior mesenteric artery and its branches usually as far as left colic (splenic) flexure
Small intestine
Efferent fibers
Afferent fibers
Parasympathetic fibers
F. Netter M.D.

See also Plate 39

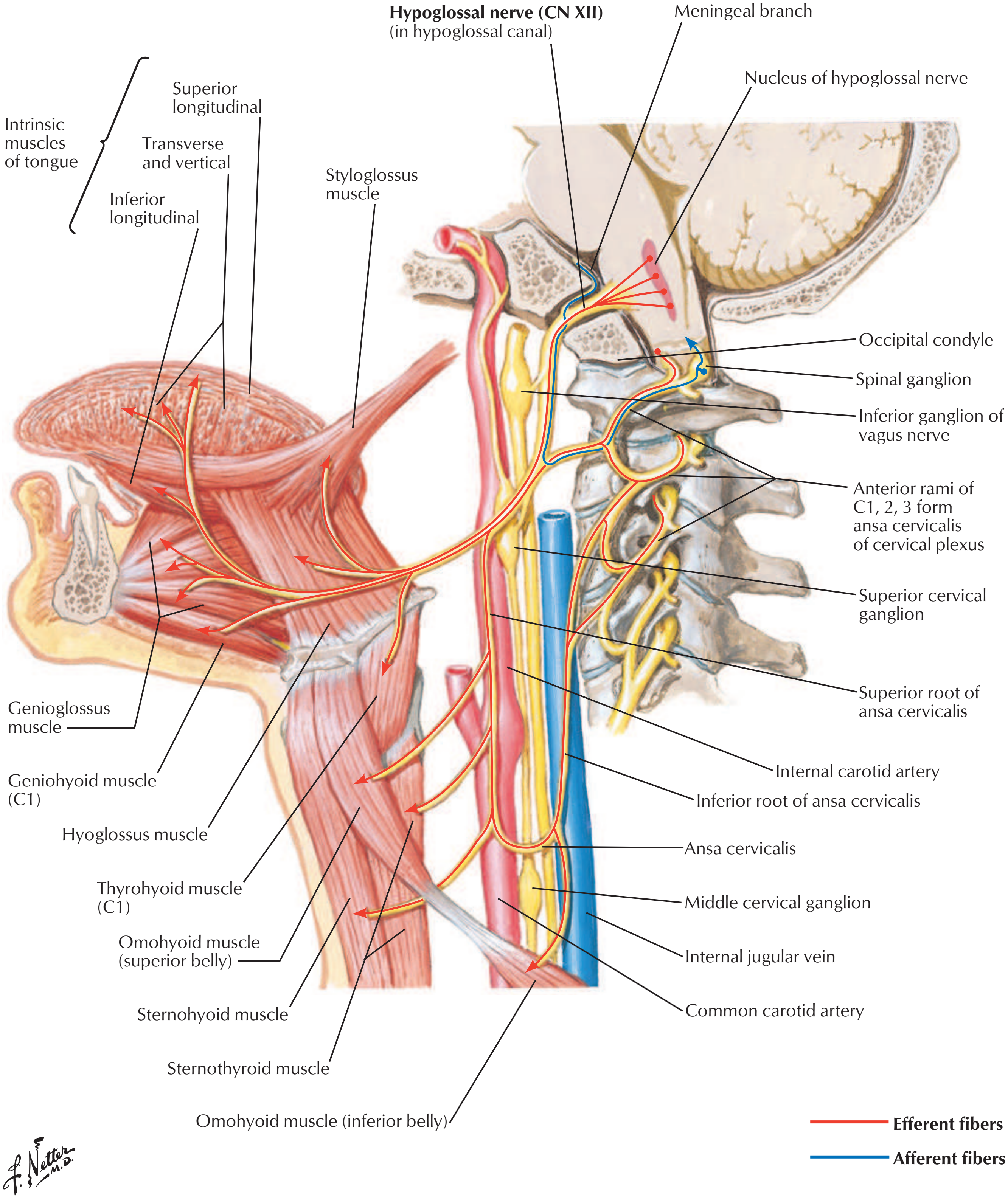

Nucleus ambiguus
Vagus nerve (CN X)
Cranial root of accessory nerve (CN XI)
Spinal root of accessory nerve (CN XI)
Foramen magnum
Jugular foramen
Superior ganglion of vagus nerve (CN X)
Accessory nerve (CN XI)
Inferior ganglion of vagus nerve (CN X)
C1 spinal nerve
C2 spinal nerve
Accessory nerve (to sternocleidomastoid and trapezius muscles)
Sternocleidomastoid muscle (*cut*)
C3 spinal nerve
C4 spinal nerve
Trapezius muscle
F. Netter M.D.

Efferent fibers

Sensory fibers

Hypoglossal Nerve (CN XII): Schema

See also Plate 39

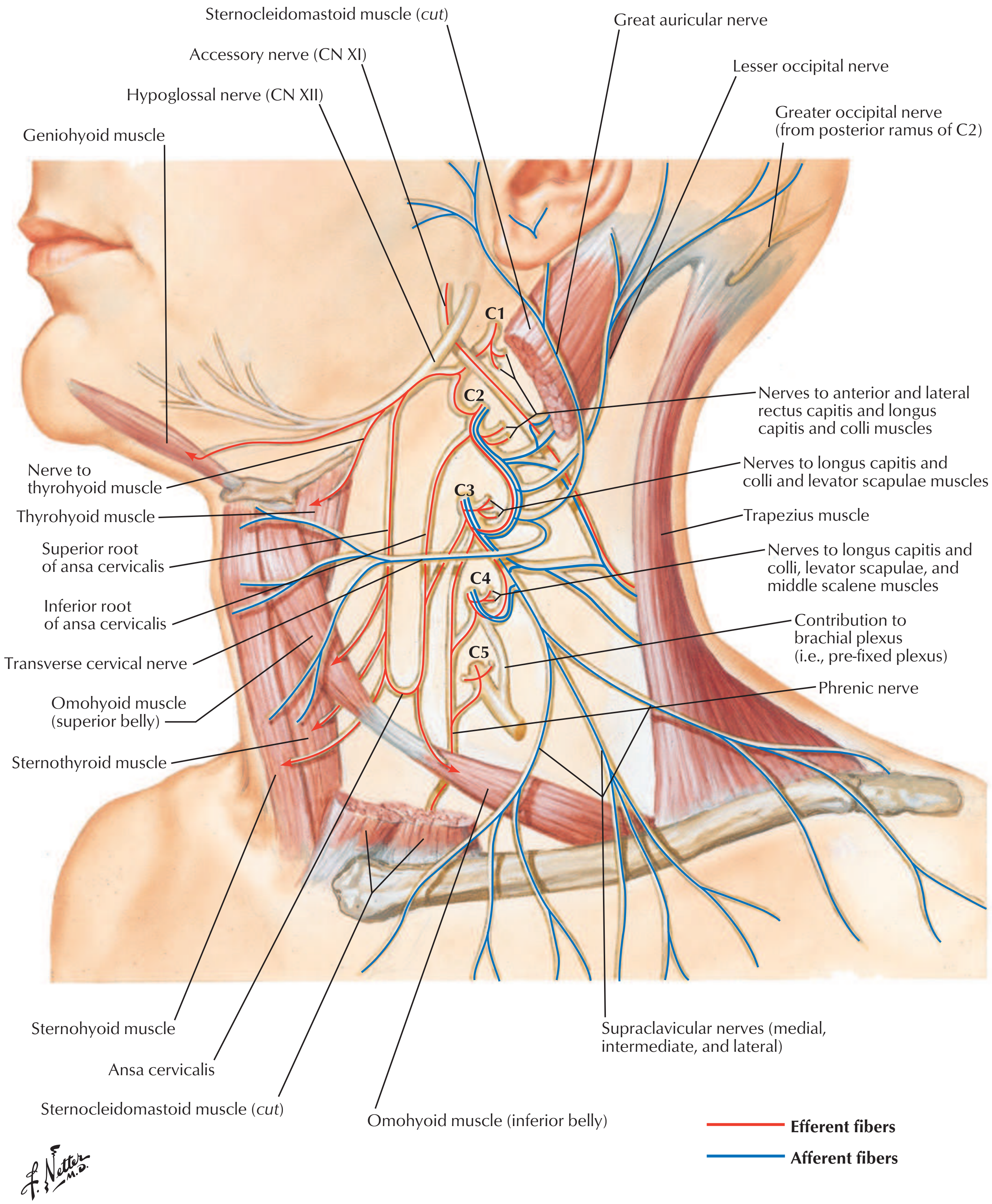

Hypoglossal nerve (CN XII)
(in hypoglossal canal)
Meningeal branch
Nucleus of hypoglossal nerve
Superior longitudinal
Intrinsic muscles of tongue
Transverse and vertical
Inferior longitudinal
Styloglossus muscle
Occipital condyle
Spinal ganglion
Inferior ganglion of vagus nerve
Anterior rami of C1, 2, 3 form ansa cervicalis of cervical plexus
Superior cervical ganglion
Superior root of ansa cervicalis
Genioglossus muscle
Internal carotid artery
Geniohyoid muscle (C1)
Inferior root of ansa cervicalis
Hyoglossus muscle
Ansa cervicalis
Thyrohyoid muscle (C1)
Middle cervical ganglion
Omohyoid muscle (superior belly)
Internal jugular vein
Common carotid artery
Sternohyoid muscle
Sternothyroid muscle
Omohyoid muscle (inferior belly)
F. Netter M.D.

Efferent fibers

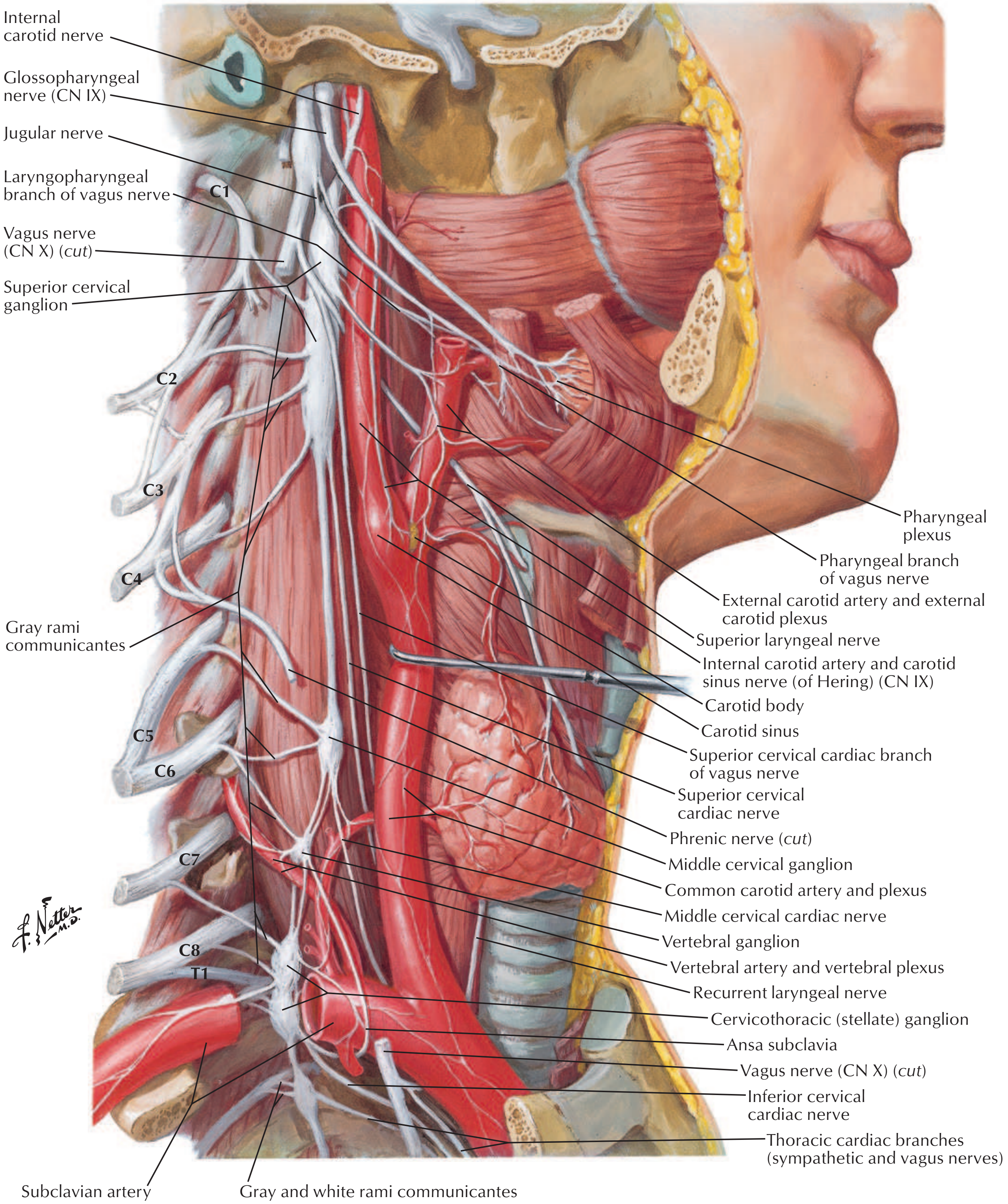
Afferent fibers

Cervical Plexus: Schema

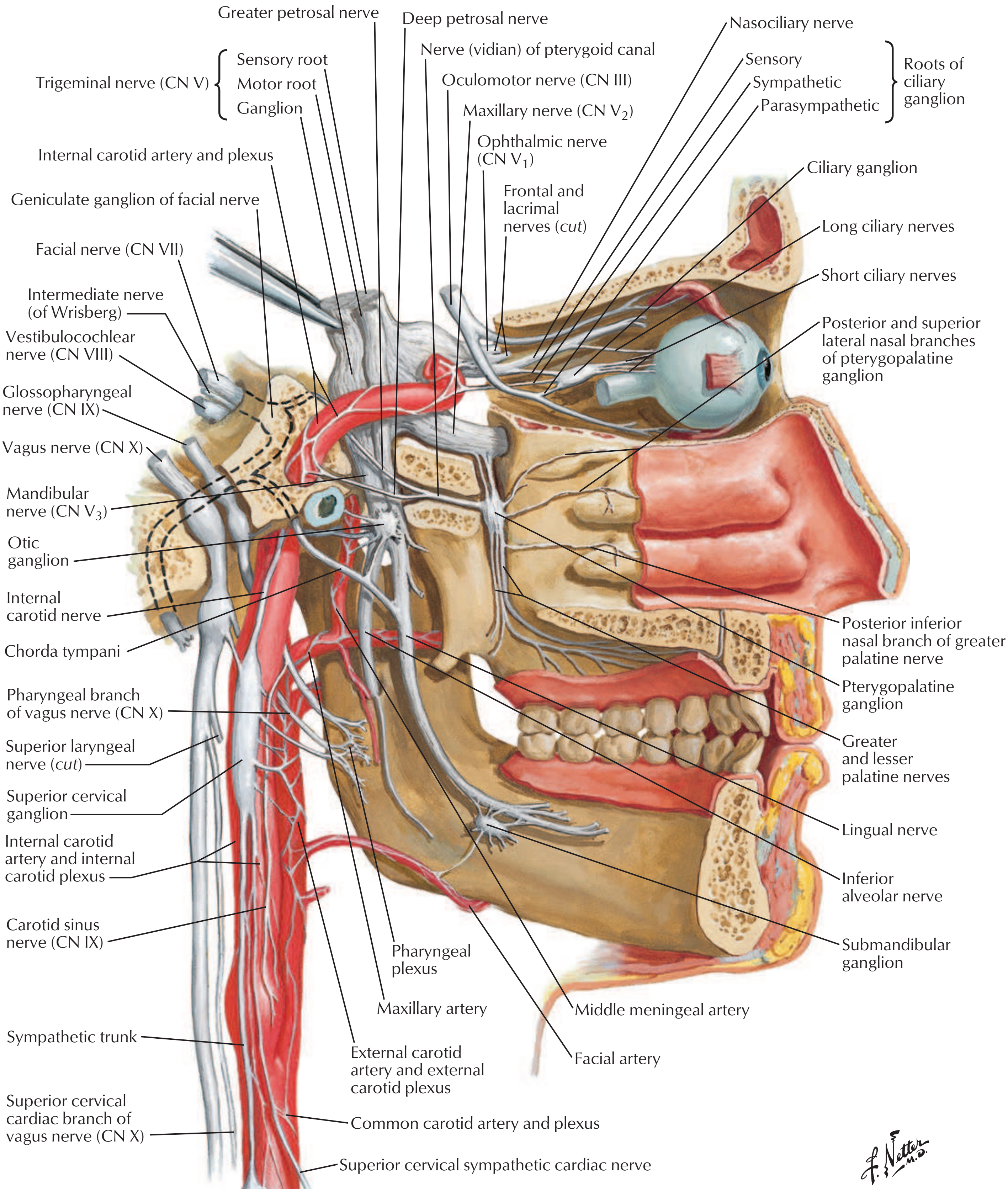
See also Plates 39, 40


Sternocleidomastoid muscle (*cut*)
Great auricular nerve
Accessory nerve (CN XI)
Lesser occipital nerve
Hypoglossal nerve (CN XII)
Greater occipital nerve (from posterior ramus of C2)
Geniohyoid muscle
C1
C2
C3
C4
C5
Nerves to anterior and lateral rectus capitis and longus capitis and colli muscles
Nerve to thyrohyoid muscle
Nerves to longus capitis and colli and levator scapulae muscles
Thyrohyoid muscle
Trapezius muscle
Superior root of ansa cervicalis
Nerves to longus capitis and colli, levator scapulae, and middle scalene muscles
Inferior root of ansa cervicalis
Contribution to brachial plexus (i.e., pre-fixed plexus)
Transverse cervical nerve
Phrenic nerve
Omohyoid muscle (superior belly)
Sternothyroid muscle
Sternohyoid muscle
Supraclavicular nerves (medial, intermediate, and lateral)
Ansa cervicalis
Sternocleidomastoid muscle (*cut*)
Omohyoid muscle (inferior belly)
Efferent fibers
Afferent fibers

See also **Plate 136**

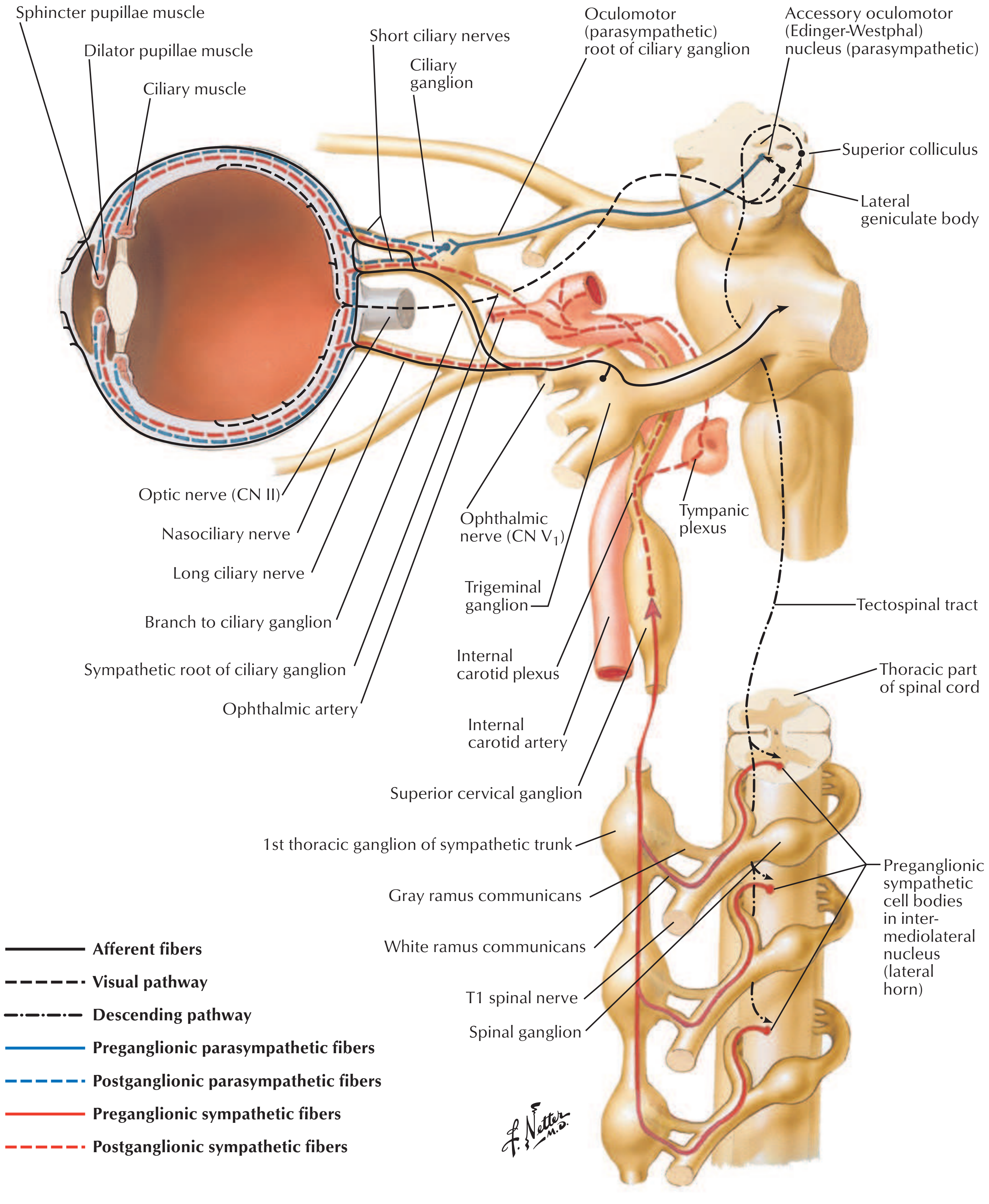

Internal carotid nerve
Glossopharyngeal nerve (CN IX)
Jugular nerve
Laryngopharyngeal branch of vagus nerve
C1
Vagus nerve (CN X) (*cut*)
Superior cervical ganglion
C2
C3
C4
Gray rami communicantes
C5
C6
C7
C8
T1
Subclavian artery
Gray and white rami communicantes
Pharyngeal plexus
Pharyngeal branch of vagus nerve
External carotid artery and external carotid plexus
Superior laryngeal nerve
Internal carotid artery and carotid sinus nerve (of Hering) (CN IX)
Carotid body
Carotid sinus
Superior cervical cardiac branch of vagus nerve
Superior cervical cardiac nerve
Phrenic nerve (*cut*)
Middle cervical ganglion
Common carotid artery and plexus
Middle cervical cardiac nerve
Vertebral ganglion
Vertebral artery and vertebral plexus
Recurrent laryngeal nerve
Cervicothoracic (stellate) ganglion
Ansa subclavia
Vagus nerve (CN X) (*cut*)
Inferior cervical cardiac nerve
Thoracic cardiac branches (sympathetic and vagus nerves)

See also Plates 62, 133, 144


Greater petrosal nerve
Deep petrosal nerve
Nerve (vidian) of pterygoid canal
Oculomotor nerve (CN III)
Maxillary nerve (CN V_2)
Ophthalmic nerve (CN V_1)
Frontal and lacrimal nerves (*cut*)
Nasociliary nerve
Sensory
Sympathetic
Parasympathetic
Roots of ciliary ganglion
Ciliary ganglion
Long ciliary nerves
Short ciliary nerves
Posterior and superior lateral nasal branches of pterygopalatine ganglion
Trigeminal nerve (CN V)
Sensory root
Motor root
Ganglion
Internal carotid artery and plexus
Geniculate ganglion of facial nerve
Facial nerve (CN VII)
Intermediate nerve (of Wrisberg)
Vestibulocochlear nerve (CN VIII)
Glossopharyngeal nerve (CN IX)
Vagus nerve (CN X)
Mandibular nerve (CN V_3)
Otic ganglion
Internal carotid nerve
Chorda tympani
Pharyngeal branch of vagus nerve (CN X)
Superior laryngeal nerve (*cut*)
Superior cervical ganglion
Internal carotid artery and internal carotid plexus
Carotid sinus nerve (CN IX)
Sympathetic trunk
Superior cervical cardiac branch of vagus nerve (CN X)
Posterior inferior nasal branch of greater palatine nerve
Pterygopalatine ganglion
Greater and lesser palatine nerves
Lingual nerve
Inferior alveolar nerve
Submandibular ganglion
Pharyngeal plexus
Maxillary artery
Middle meningeal artery
External carotid artery and external carotid plexus
Facial artery
Common carotid artery and plexus
Superior cervical sympathetic cardiac nerve
F. Netter M.D.

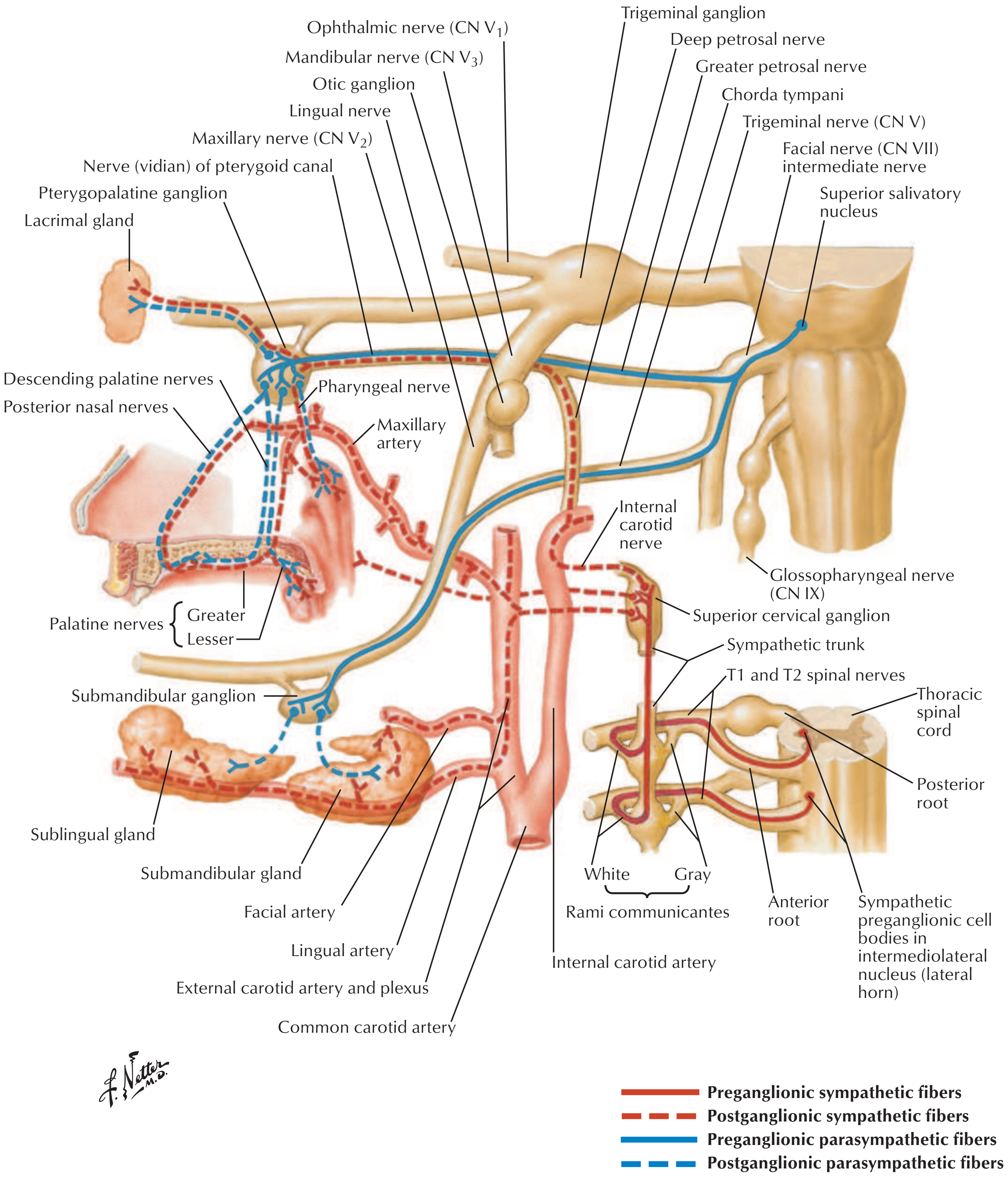
Ciliary Ganglion: Schema

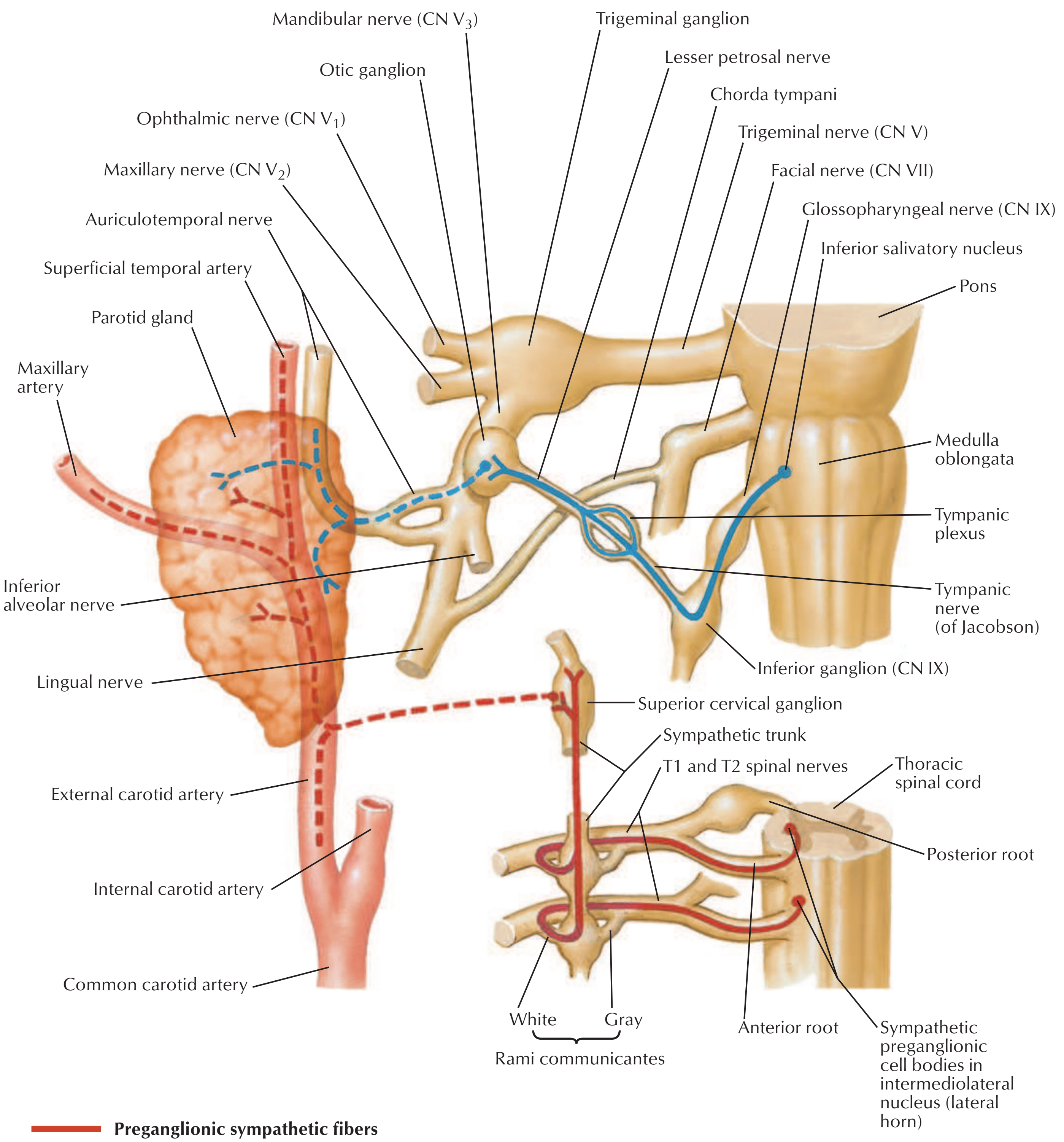
See also Plate 62


Sphincter pupillae muscle
Dilator pupillae muscle
Ciliary muscle
Short ciliary nerves
Ciliary ganglion
Oculomotor (parasympathetic) root of ciliary ganglion
Accessory oculomotor (Edinger-Westphal) nucleus (parasympathetic)
Superior colliculus
Lateral geniculate body
Optic nerve (CN II)
Nasociliary nerve
Long ciliary nerve
Branch to ciliary ganglion
Sympathetic root of ciliary ganglion
Ophthalmic artery
Ophthalmic nerve (CN V_1)
Trigeminal ganglion
Internal carotid plexus
Internal carotid artery
Superior cervical ganglion
Tympanic plexus
Tectospinal tract
Thoracic part of spinal cord
1st thoracic ganglion of sympathetic trunk
Gray ramus communicans
White ramus communicans
T1 spinal nerve
Spinal ganglion
Preganglionic sympathetic cell bodies in intermediolateral nucleus (lateral horn)
Afferent fibers
Visual pathway
Descending pathway
Preganglionic parasympathetic fibers
Postganglionic parasympathetic fibers
Preganglionic sympathetic fibers
Postganglionic sympathetic fibers
F. Netter M.D.

Pterygopalatine and Submandibular Ganglia: Schema

See also Plate 95

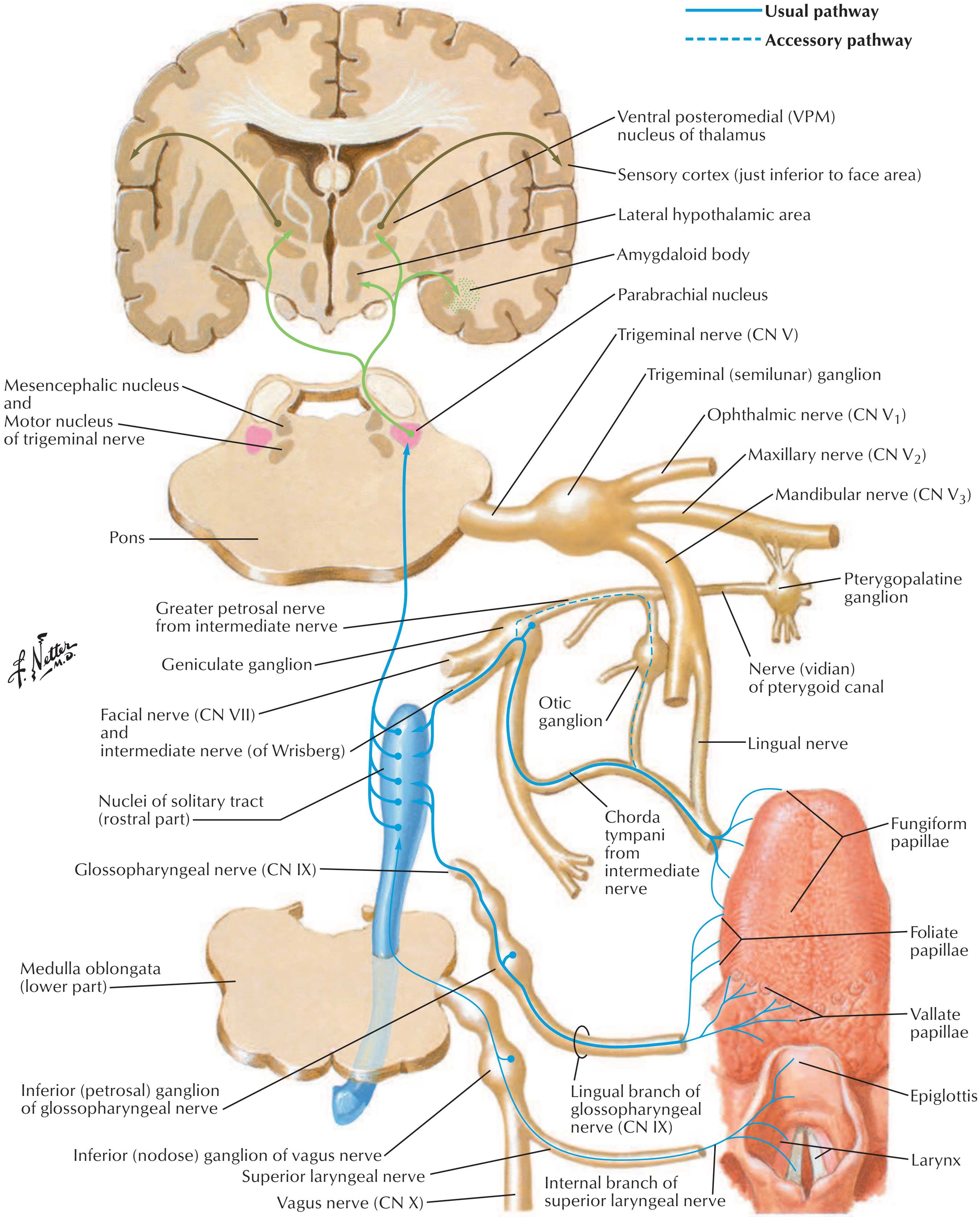

Ophthalmic nerve (CN V_1)
Mandibular nerve (CN V_3)
Otic ganglion
Lingual nerve
Maxillary nerve (CN V_2)
Nerve (vidian) of pterygoid canal
Pterygopalatine ganglion
Lacrimal gland
Trigeminal ganglion
Deep petrosal nerve
Greater petrosal nerve
Chorda tympani
Trigeminal nerve (CN V)
Facial nerve (CN VII) intermediate nerve
Superior salivatory nucleus
Descending palatine nerves
Posterior nasal nerves
Pharyngeal nerve
Maxillary artery
Internal carotid nerve
Glossopharyngeal nerve (CN IX)
Superior cervical ganglion
Palatine nerves
Greater
Lesser
Sympathetic trunk
T1 and T2 spinal nerves
Thoracic spinal cord
Submandibular ganglion
Posterior root
Sublingual gland
Submandibular gland
Facial artery
Lingual artery
External carotid artery and plexus
Common carotid artery
White
Gray
Rami communicantes
Internal carotid artery
Anterior root
Sympathetic preganglionic cell bodies in intermediolateral nucleus (lateral horn)
F. Netter M.D.
Preganglionic sympathetic fibers
Postganglionic sympathetic fibers
Preganglionic parasympathetic fibers
Postganglionic parasympathetic fibers


Mandibular nerve (CN V3)
Trigeminal ganglion
Lesser petrosal nerve
Otic ganglion
Chorda tympani
Ophthalmic nerve (CN V1)
Trigeminal nerve (CN V)
Maxillary nerve (CN V2)
Facial nerve (CN VII)
Glossopharyngeal nerve (CN IX)
Auriculotemporal nerve
Inferior salivatory nucleus
Superficial temporal artery
Pons
Parotid gland
Maxillary artery
Medulla oblongata
Tympanic plexus
Inferior alveolar nerve
Tympanic nerve (of Jacobson)
Inferior ganglion (CN IX)
Lingual nerve
Superior cervical ganglion
Sympathetic trunk
T1 and T2 spinal nerves
Thoracic spinal cord
External carotid artery
Posterior root
Internal carotid artery
Common carotid artery
White
Gray
Rami communicantes
Anterior root
Sympathetic preganglionic cell bodies in intermediolateral nucleus (lateral horn)

Preganglionic sympathetic fibers
Postganglionic sympathetic fibers
Preganglionic parasympathetic fibers
Postganglionic parasympathetic fibers

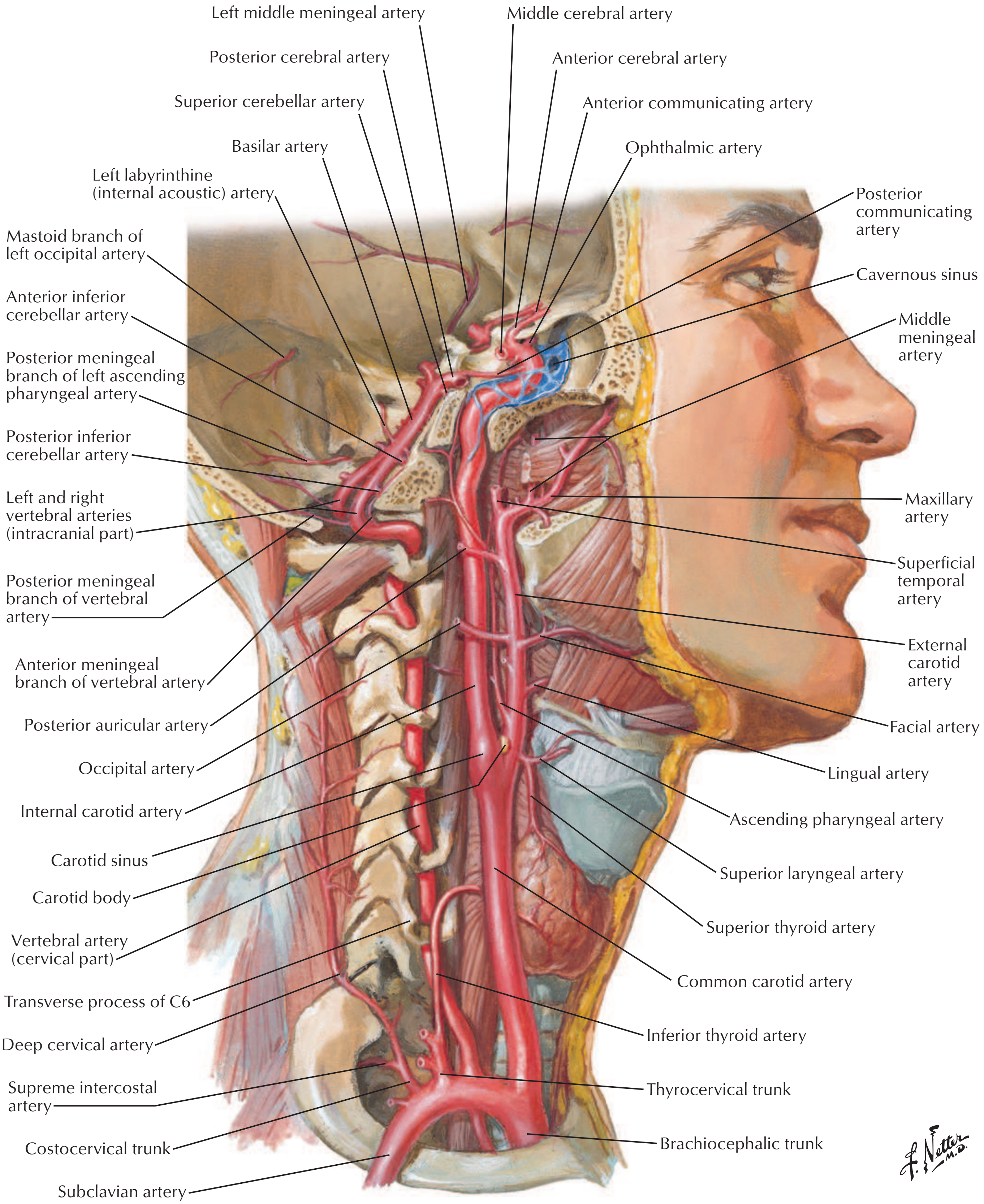
Taste Pathways: Schema

See also Plates 134, 136

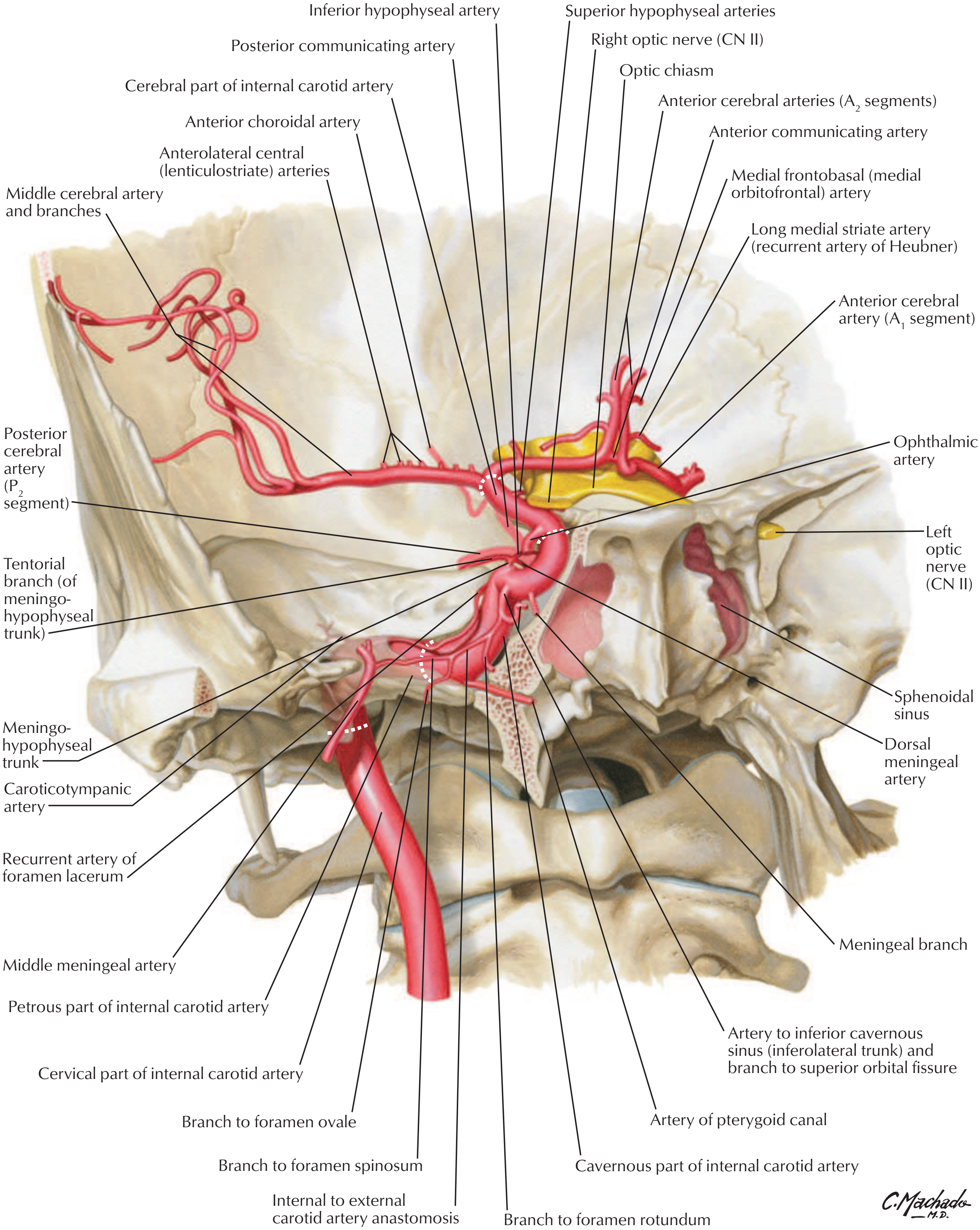

Usual pathway
Accessory pathway
Ventral posteromedial (VPM) nucleus of thalamus
Sensory cortex (just inferior to face area)
Lateral hypothalamic area
Amygdaloid body
Parabrachial nucleus
Trigeminal nerve (CN V)
Trigeminal (semilunar) ganglion
Ophthalmic nerve (CN V_1)
Maxillary nerve (CN V_2)
Mandibular nerve (CN V_3)
Mesencephalic nucleus and Motor nucleus of trigeminal nerve
Pons
Pterygopalatine ganglion
Greater petrosal nerve from intermediate nerve
Geniculate ganglion
Nerve (vidian) of pterygoid canal
Facial nerve (CN VII) and intermediate nerve (of Wrisberg)
Otic ganglion
Lingual nerve
Nuclei of solitary tract (rostral part)
Chorda tympani from intermediate nerve
Fungiform papillae
Glossopharyngeal nerve (CN IX)
Foliate papillae
Medulla oblongata (lower part)
Vallate papillae
Inferior (petrosal) ganglion of glossopharyngeal nerve
Lingual branch of glossopharyngeal nerve (CN IX)
Epiglottis
Inferior (nodose) ganglion of vagus nerve
Superior laryngeal nerve
Vagus nerve (CN X)
Internal branch of superior laryngeal nerve
Larynx
F. Netter M.D.

Arteries to Brain and Meninges

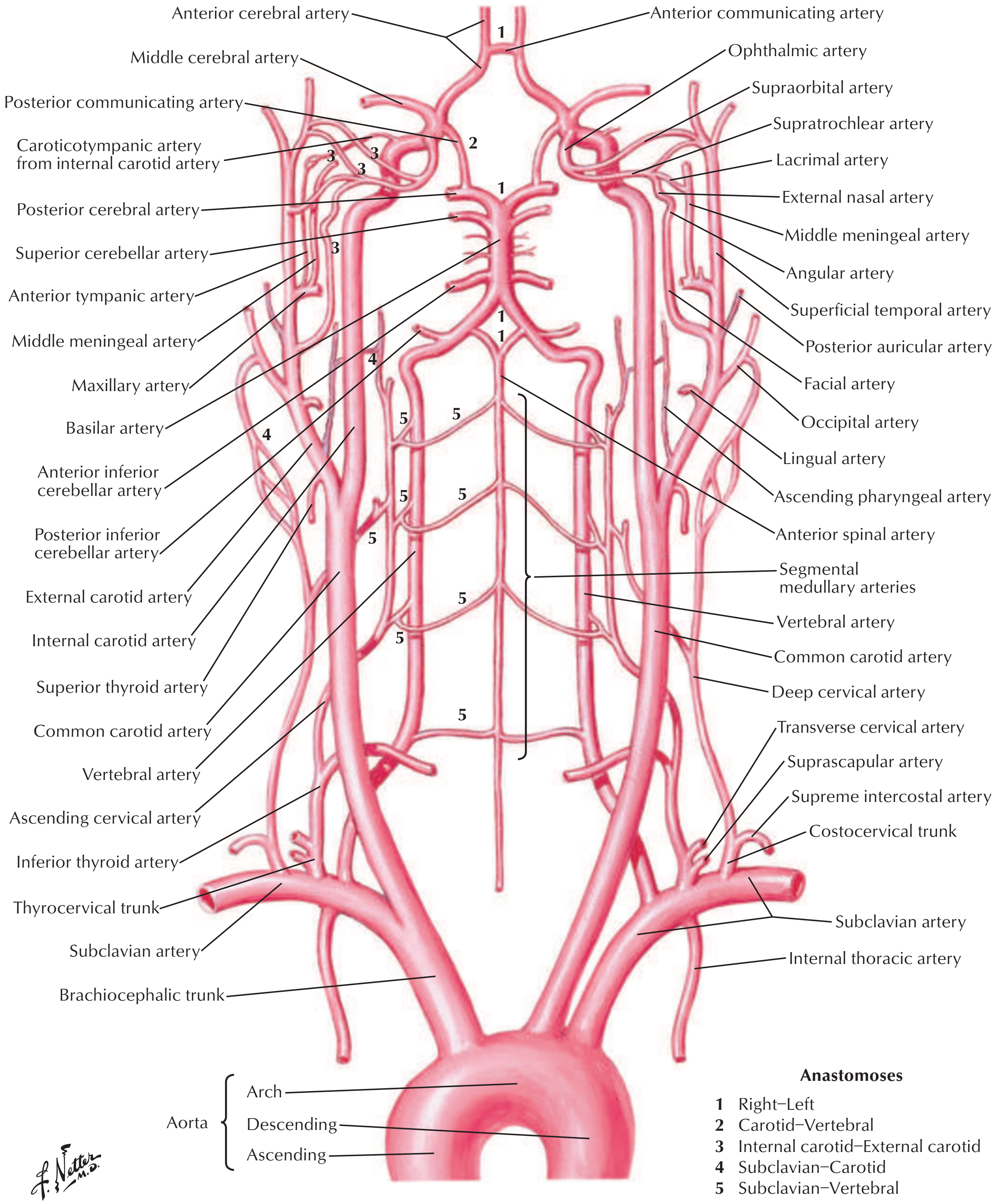
See also Plates 41, 64, 148


Left middle meningeal artery
Middle cerebral artery
Posterior cerebral artery
Anterior cerebral artery
Superior cerebellar artery
Anterior communicating artery
Basilar artery
Ophthalmic artery
Left labyrinthine (internal acoustic) artery
Posterior communicating artery
Mastoid branch of left occipital artery
Cavernous sinus
Anterior inferior cerebellar artery
Middle meningeal artery
Posterior meningeal branch of left ascending pharyngeal artery
Posterior inferior cerebellar artery
Left and right vertebral arteries (intracranial part)
Maxillary artery
Superficial temporal artery
Posterior meningeal branch of vertebral artery
External carotid artery
Anterior meningeal branch of vertebral artery
Facial artery
Posterior auricular artery
Lingual artery
Occipital artery
Ascending pharyngeal artery
Internal carotid artery
Superior laryngeal artery
Carotid sinus
Superior thyroid artery
Carotid body
Vertebral artery (cervical part)
Common carotid artery
Transverse process of C6
Inferior thyroid artery
Deep cervical artery
Supreme intercostal artery
Thyrocervical trunk
Costocervical trunk
Brachiocephalic trunk
Subclavian artery
F. Netter M.D.

See also Plates 147, 150

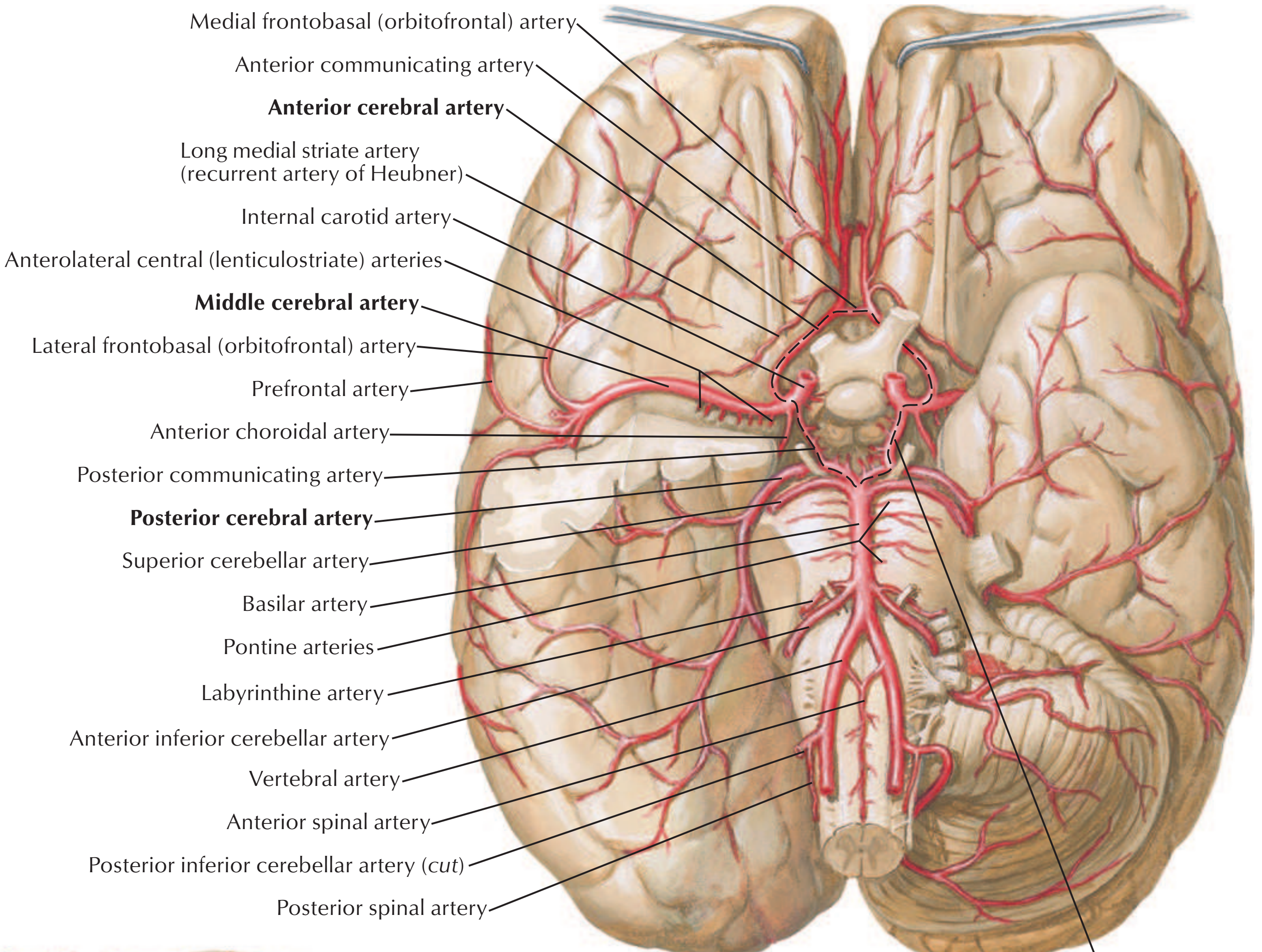

Inferior hypophyseal artery
Superior hypophyseal arteries
Posterior communicating artery
Right optic nerve (CN II)
Optic chiasm
Cerebral part of internal carotid artery
Anterior cerebral arteries (A2 segments)
Anterior choroidal artery
Anterior communicating artery
Anterolateral central (lenticulostriate) arteries
Medial frontobasal (medial orbitofrontal) artery
Middle cerebral artery and branches
Long medial striate artery (recurrent artery of Heubner)
Anterior cerebral artery (A1 segment)
Posterior cerebral artery (P2 segment)
Ophthalmic artery
Left optic nerve (CN II)
Tentorial branch (of meningo-hypophyseal trunk)
Sphenoidal sinus
Dorsal meningeal artery
Meningo-hypophyseal trunk
Caroticotympanic artery
Recurrent artery of foramen lacerum
Meningeal branch
Middle meningeal artery
Petrous part of internal carotid artery
Artery to inferior cavernous sinus (inferolateral trunk) and branch to superior orbital fissure
Cervical part of internal carotid artery
Artery of pterygoid canal
Branch to foramen ovale
Branch to foramen spinosum
Cavernous part of internal carotid artery
Internal to external carotid artery anastomosis
Branch to foramen rotundum
C. Machado M.D.

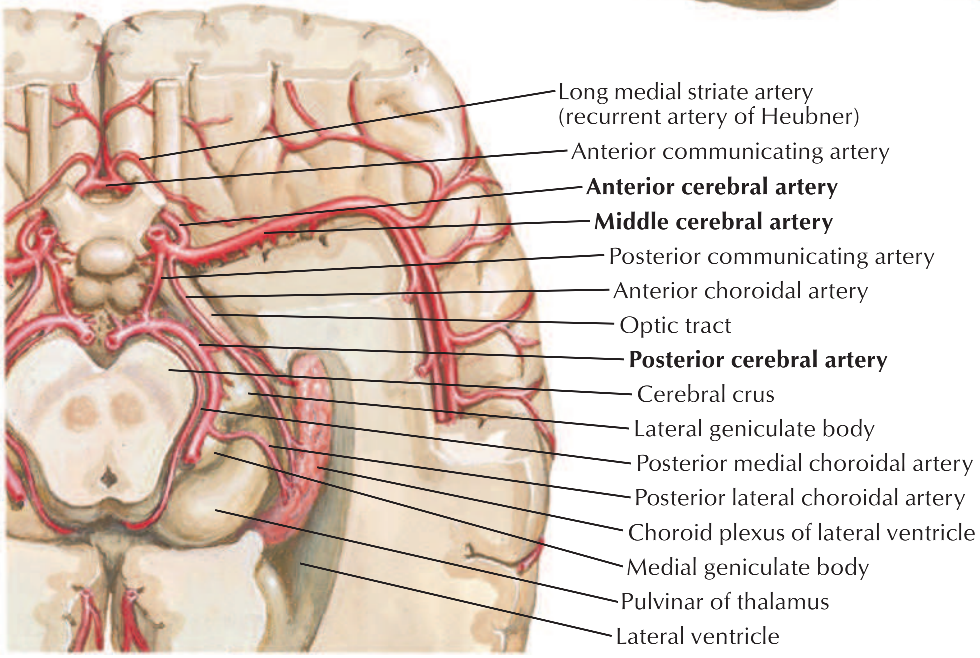
Arteries to Brain: Schema


Anterior cerebral artery
Middle cerebral artery
Posterior communicating artery
Caroticotympanic artery from internal carotid artery
Posterior cerebral artery
Superior cerebellar artery
Anterior tympanic artery
Middle meningeal artery
Maxillary artery
Basilar artery
Anterior inferior cerebellar artery
Posterior inferior cerebellar artery
External carotid artery
Internal carotid artery
Superior thyroid artery
Common carotid artery
Vertebral artery
Ascending cervical artery
Inferior thyroid artery
Thyrocervical trunk
Subclavian artery
Brachiocephalic trunk
Anterior communicating artery
Ophthalmic artery
Supraorbital artery
Supratrochlear artery
Lacrimal artery
External nasal artery
Middle meningeal artery
Angular artery
Superficial temporal artery
Posterior auricular artery
Facial artery
Occipital artery
Lingual artery
Ascending pharyngeal artery
Anterior spinal artery
Segmental medullary arteries
Vertebral artery
Common carotid artery
Deep cervical artery
Transverse cervical artery
Suprascapular artery
Supreme intercostal artery
Costocervical trunk
Subclavian artery
Internal thoracic artery
Aorta
Arch
Descending
Ascending
1
2
1
3
3
3
3
1
1
4
4
5
5
5
5
5
5
5
5
5
Anastomoses
1 Right–Left
2 Carotid–Vertebral
3 Internal carotid–External carotid
4 Subclavian–Carotid
5 Subclavian–Vertebral

Arteries of Brain: Inferior Views

See also Plate 148


Medial frontobasal (orbitofrontal) artery
Anterior communicating artery
Anterior cerebral artery
Long medial striate artery (recurrent artery of Heubner)
Internal carotid artery
Anterolateral central (lenticulostriate) arteries
Middle cerebral artery
Lateral frontobasal (orbitofrontal) artery
Prefrontal artery
Anterior choroidal artery
Posterior communicating artery
Posterior cerebral artery
Superior cerebellar artery
Basilar artery
Pontine arteries
Labyrinthine artery
Anterior inferior cerebellar artery
Vertebral artery
Anterior spinal artery
Posterior inferior cerebellar artery (*cut*)
Posterior spinal artery
Cerebral arterial circle (of Willis) (*broken line*)


Long medial striate artery (recurrent artery of Heubner)
Anterior communicating artery
Anterior cerebral artery
Middle cerebral artery
Posterior communicating artery
Anterior choroidal artery
Optic tract
Posterior cerebral artery
Cerebral crus
Lateral geniculate body
Posterior medial choroidal artery
Posterior lateral choroidal artery
Choroid plexus of lateral ventricle
Medial geniculate body
Pulvinar of thalamus
Lateral ventricle

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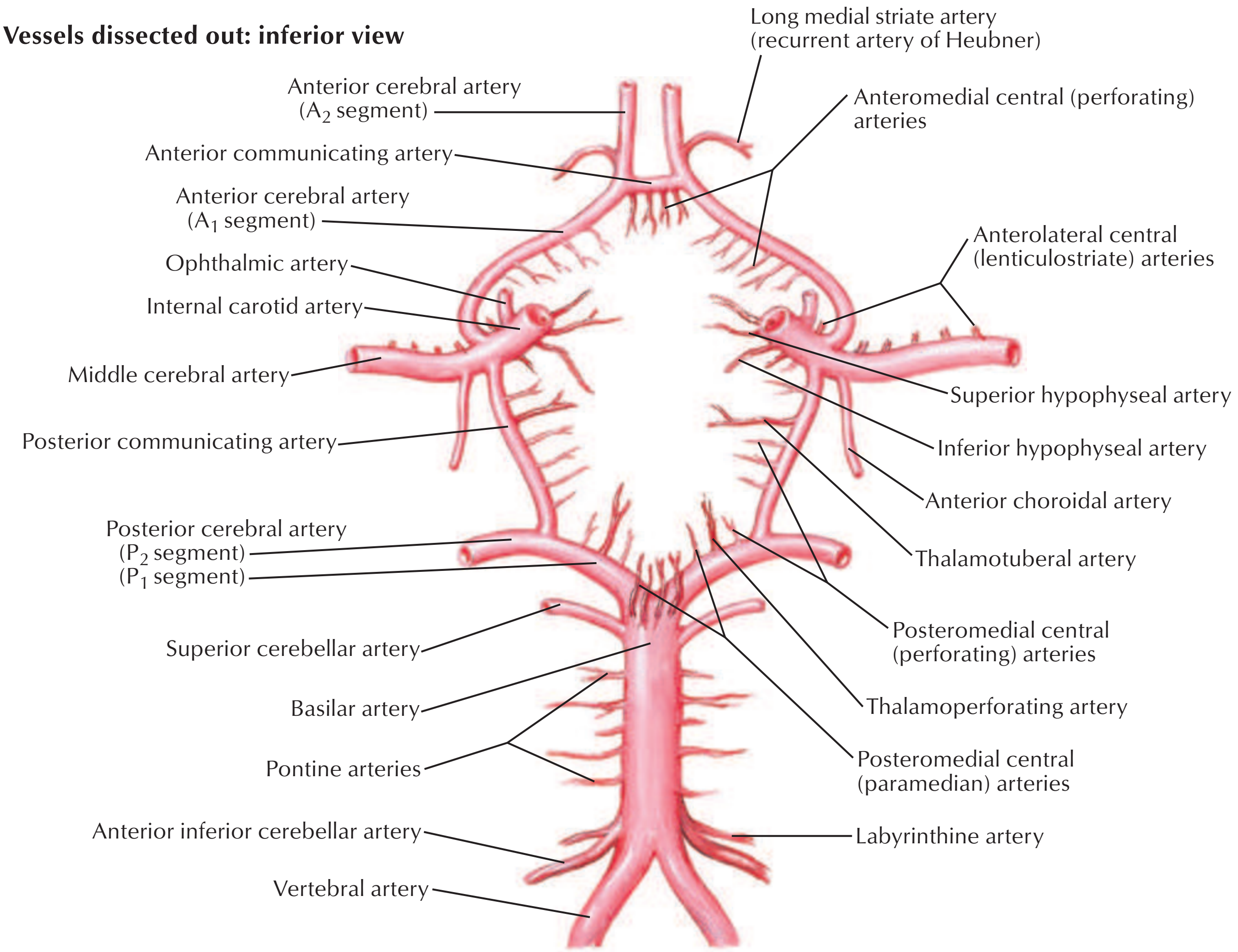
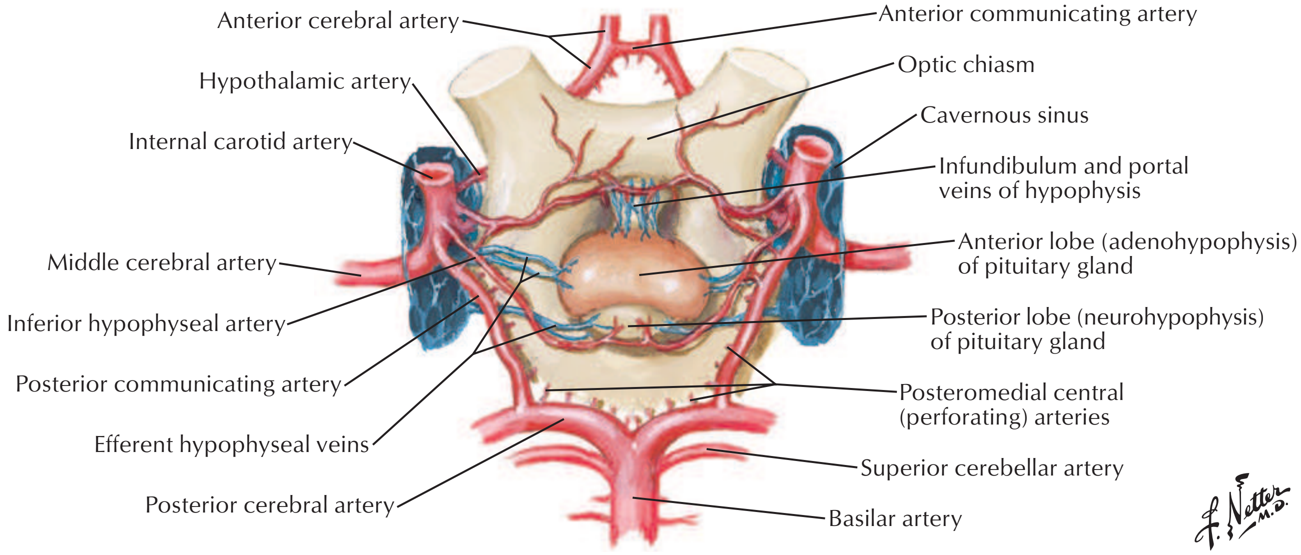
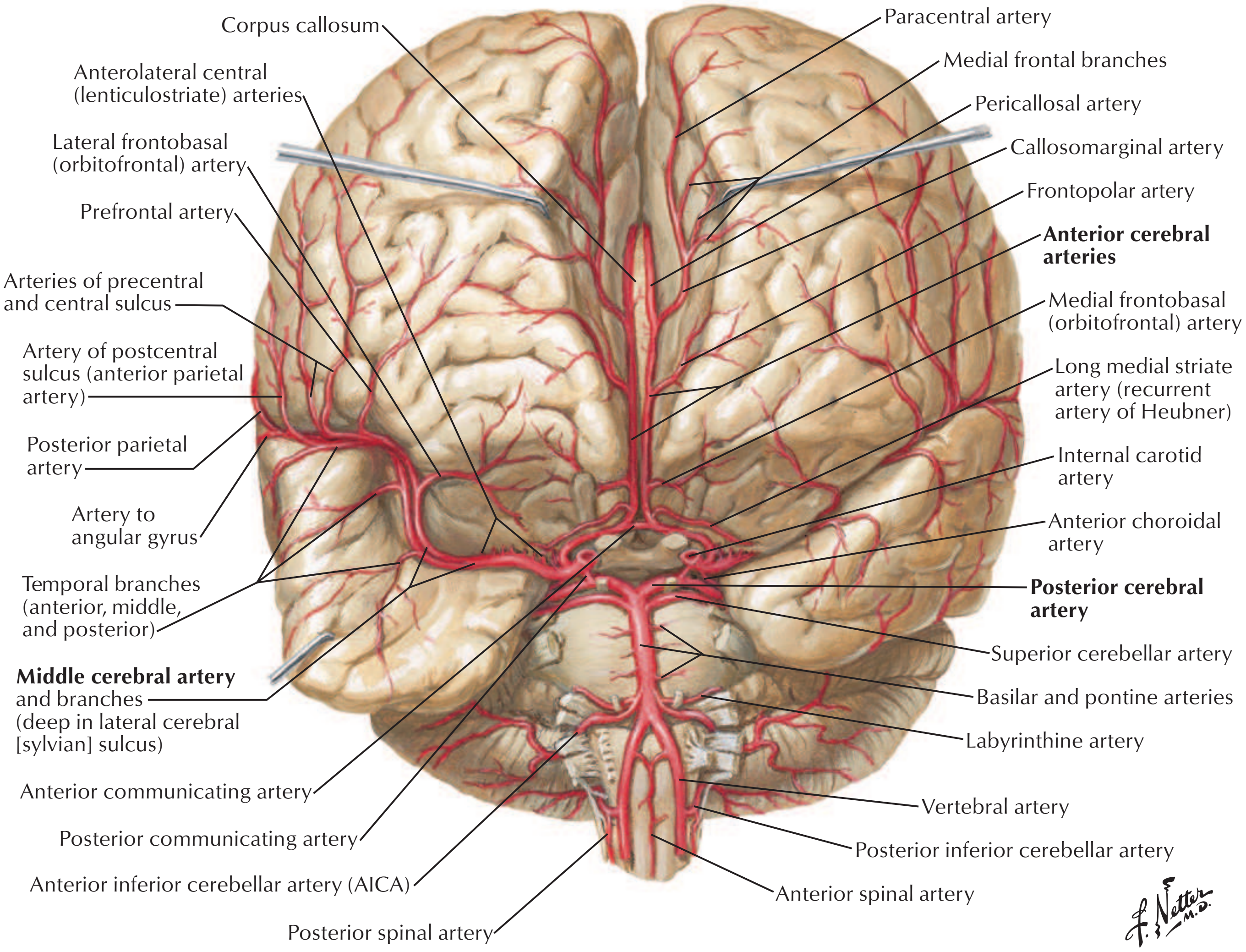
Cerebral Arterial Circle (of Willis)

Vessels dissected out: inferior view


Long medial striate artery (recurrent artery of Heubner)
Anterior cerebral artery (A_2 segment)
Anteromedial central (perforating) arteries
Anterior communicating artery
Anterior cerebral artery (A_1 segment)
Anterolateral central (lenticulostriate) arteries
Ophthalmic artery
Internal carotid artery
Middle cerebral artery
Superior hypophyseal artery
Inferior hypophyseal artery
Posterior communicating artery
Anterior choroidal artery
Thalamotuberal artery
Posterior cerebral artery
(P_2 segment)
(P_1 segment)
Posteromedial central (perforating) arteries
Superior cerebellar artery
Basilar artery
Thalamoperforating artery
Pontine arteries
Posteromedial central (paramedian) arteries
Anterior inferior cerebellar artery
Labyrinthine artery
Vertebral artery

Vessels in situ: inferior view


Anterior cerebral artery
Anterior communicating artery
Hypothalamic artery
Optic chiasm
Cavernous sinus
Internal carotid artery
Infundibulum and portal veins of hypophysis
Middle cerebral artery
Anterior lobe (adenohypophysis) of pituitary gland
Inferior hypophyseal artery
Posterior lobe (neurohypophysis) of pituitary gland
Posterior communicating artery
Posteromedial central (perforating) arteries
Efferent hypophyseal veins
Superior cerebellar artery
Posterior cerebral artery
Basilar artery


Corpus callosum
Anterolateral central (lenticulostriate) arteries
Lateral frontobasal (orbitofrontal) artery
Prefrontal artery
Arteries of precentral and central sulcus
Artery of postcentral sulcus (anterior parietal artery)
Posterior parietal artery
Artery to angular gyrus
Temporal branches (anterior, middle, and posterior)
Middle cerebral artery and branches (deep in lateral cerebral [sylvian] sulcus)
Anterior communicating artery
Posterior communicating artery
Anterior inferior cerebellar artery (AICA)
Posterior spinal artery
Paracentral artery
Medial frontal branches
Pericallosal artery
Callosomarginal artery
Frontopolar artery
Anterior cerebral arteries
Medial frontobasal (orbitofrontal) artery
Long medial striate artery (recurrent artery of Heubner)
Internal carotid artery
Anterior choroidal artery
Posterior cerebral artery
Superior cerebellar artery
Basilar and pontine arteries
Labyrinthine artery
Vertebral artery
Posterior inferior cerebellar artery
Anterior spinal artery
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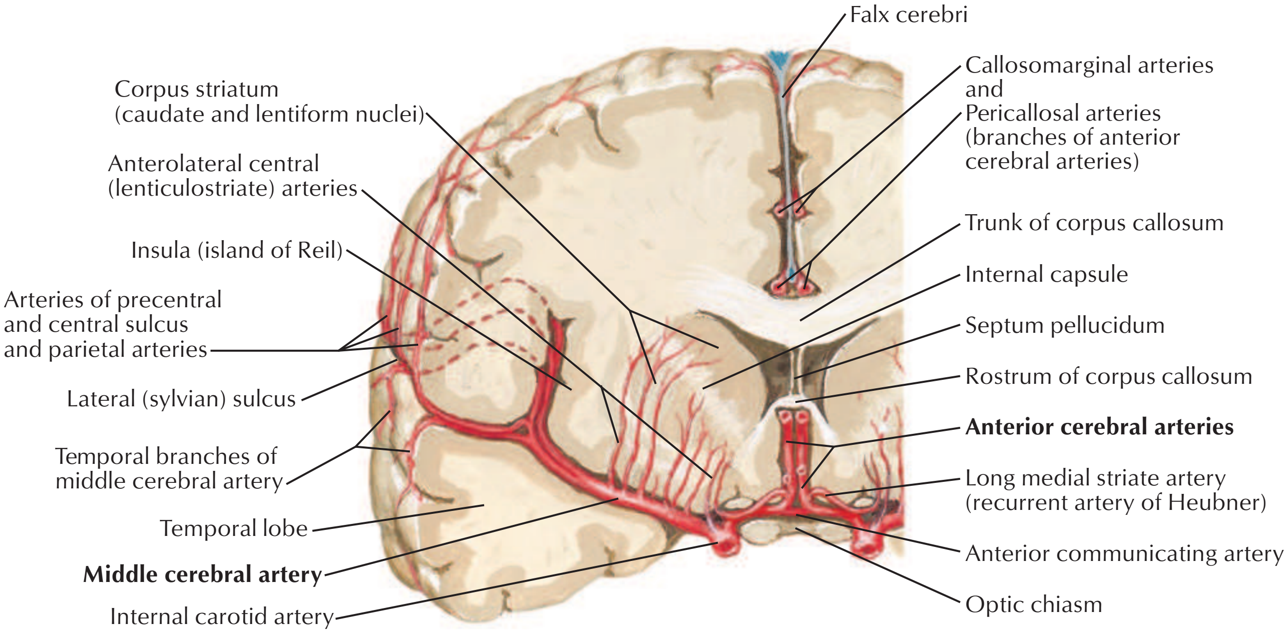
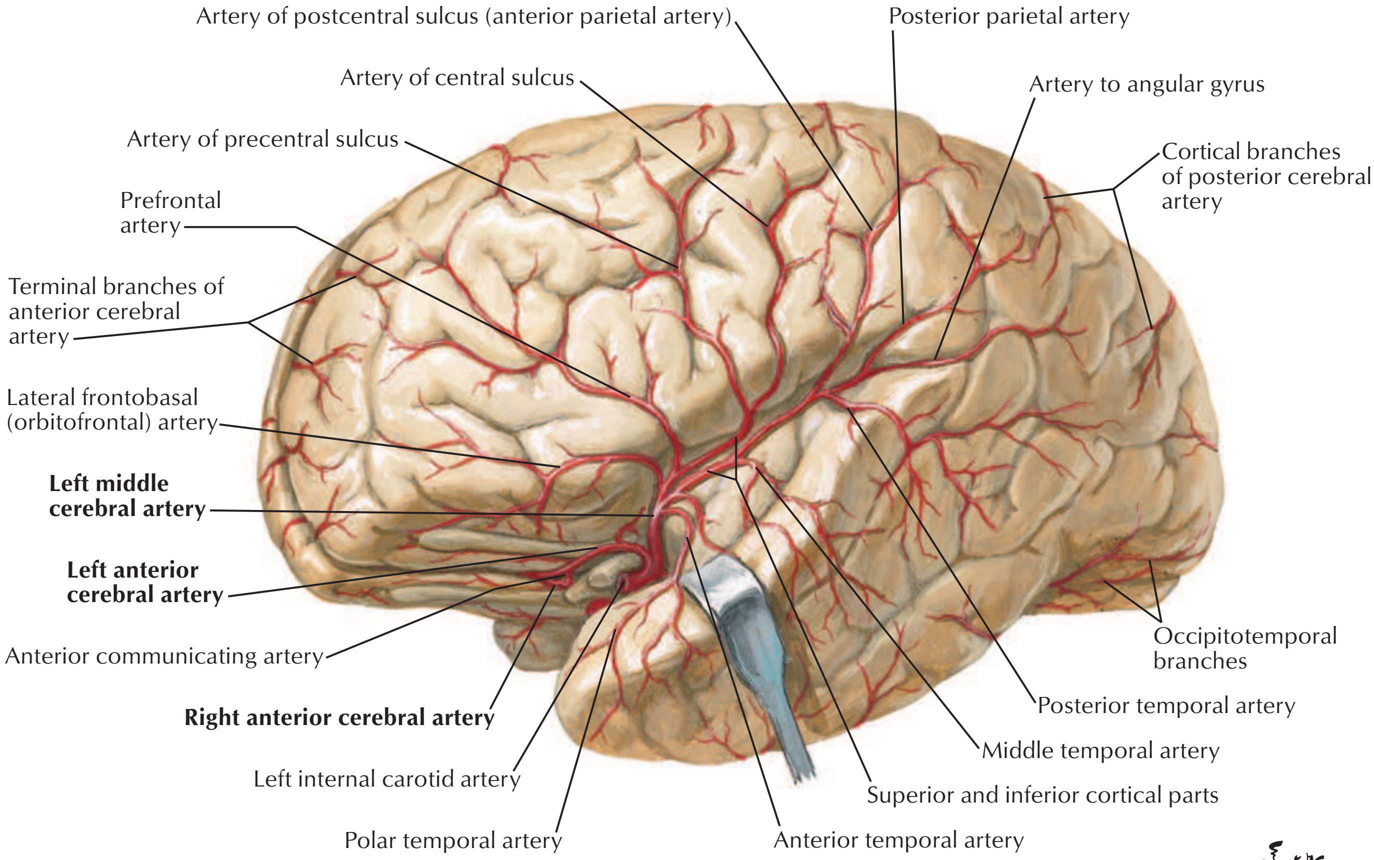

Falx cerebri
Corpus striatum (caudate and lentiform nuclei)
Anterolateral central (lenticulostriate) arteries
Insula (island of Reil)
Arteries of precentral and central sulcus and parietal arteries
Lateral (sylvian) sulcus
Temporal branches of middle cerebral artery
Temporal lobe
Middle cerebral artery
Internal carotid artery
Callosomarginal arteries and Pericallosal arteries (branches of anterior cerebral arteries)
Trunk of corpus callosum
Internal capsule
Septum pellucidum
Rostrum of corpus callosum
Anterior cerebral arteries
Long medial striate artery (recurrent artery of Heubner)
Anterior communicating artery
Optic chiasm

Arteries of Brain: Lateral and Medial Views


Artery of postcentral sulcus (anterior parietal artery)
Posterior parietal artery
Artery of central sulcus
Artery to angular gyrus
Artery of precentral sulcus
Cortical branches of posterior cerebral artery
Prefrontal artery
Terminal branches of anterior cerebral artery
Lateral frontobasal (orbitofrontal) artery
Left middle cerebral artery
Left anterior cerebral artery
Occipitotemporal branches
Anterior communicating artery
Right anterior cerebral artery
Posterior temporal artery
Middle temporal artery
Left internal carotid artery
Superior and inferior cortical parts
Polar temporal artery
Anterior temporal artery
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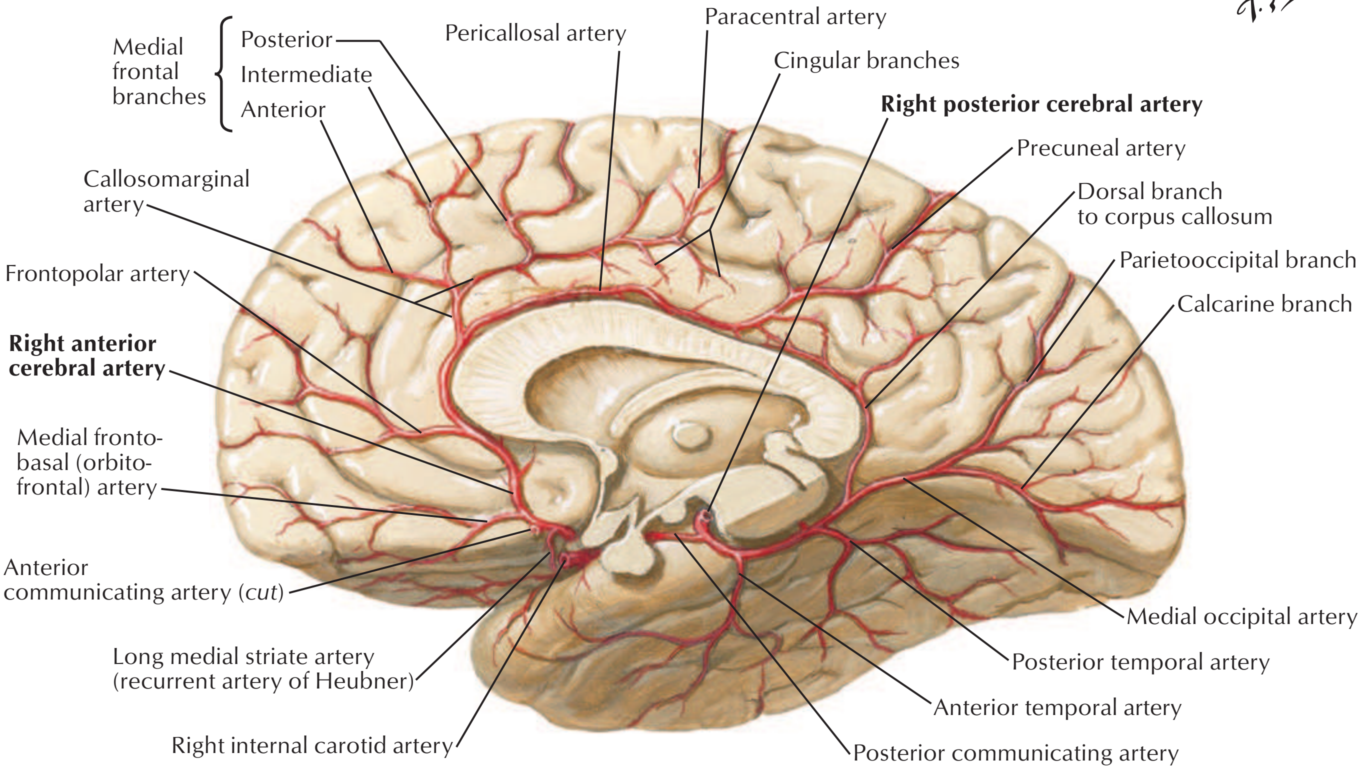
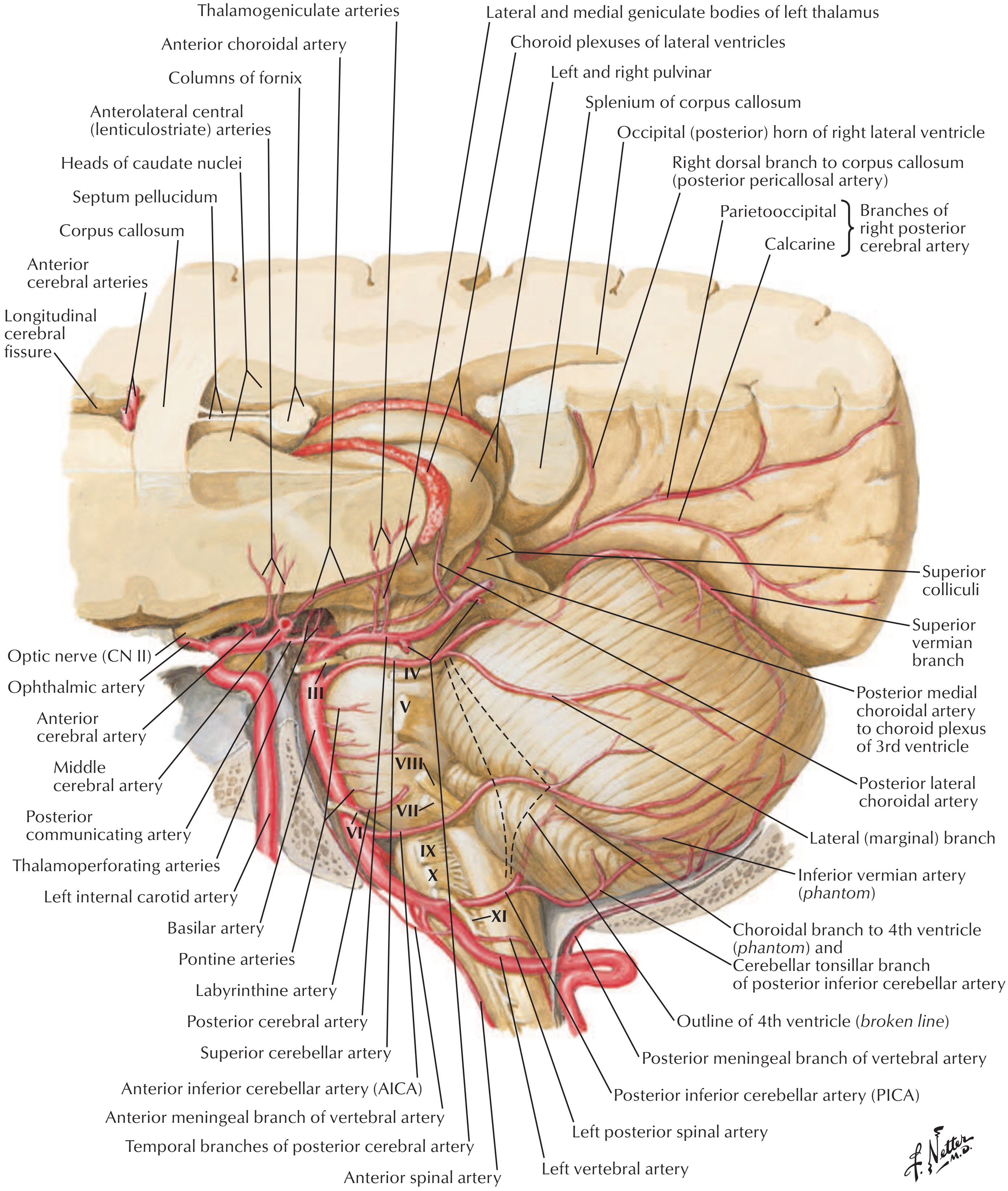

Medial frontal branches
Posterior
Intermediate
Anterior
Pericallosal artery
Paracentral artery
Cingular branches
Right posterior cerebral artery
Precuneal artery
Callosomarginal artery
Dorsal branch to corpus callosum
Frontopolar artery
Parietooccipital branch
Calcarine branch
Right anterior cerebral artery
Medial fronto-basal (orbito-frontal) artery
Anterior communicating artery (*cut*)
Medial occipital artery
Long medial striate artery (recurrent artery of Heubner)
Posterior temporal artery
Anterior temporal artery
Right internal carotid artery
Posterior communicating artery


Thalamogeniculate arteries
Anterior choroidal artery
Columns of fornix
Anterolateral central (lenticulostriate) arteries
Heads of caudate nuclei
Septum pellucidum
Corpus callosum
Anterior cerebral arteries
Longitudinal cerebral fissure
Lateral and medial geniculate bodies of left thalamus
Choroid plexuses of lateral ventricles
Left and right pulvinar
Splenium of corpus callosum
Occipital (posterior) horn of right lateral ventricle
Right dorsal branch to corpus callosum (posterior pericallosal artery)
Parietooccipital
Calcarine
Branches of right posterior cerebral artery
Superior colliculi
Superior vermian branch
Posterior medial choroidal artery to choroid plexus of 3rd ventricle
Posterior lateral choroidal artery
Lateral (marginal) branch
Inferior vermian artery (*phantom*)
Choroidal branch to 4th ventricle (*phantom*) and
Cerebellar tonsillar branch of posterior inferior cerebellar artery
Outline of 4th ventricle (*broken line*)
Posterior meningeal branch of vertebral artery
Posterior inferior cerebellar artery (PICA)
Left posterior spinal artery
Left vertebral artery
Optic nerve (CN II)
Ophthalmic artery
Anterior cerebral artery
Middle cerebral artery
Posterior communicating artery
Thalamoperforating arteries
Left internal carotid artery
Basilar artery
Pontine arteries
Labyrinthine artery
Posterior cerebral artery
Superior cerebellar artery
Anterior inferior cerebellar artery (AICA)
Anterior meningeal branch of vertebral artery
Temporal branches of posterior cerebral artery
Anterior spinal artery
III
IV
V
VI
VII
VIII
IX
X
XI
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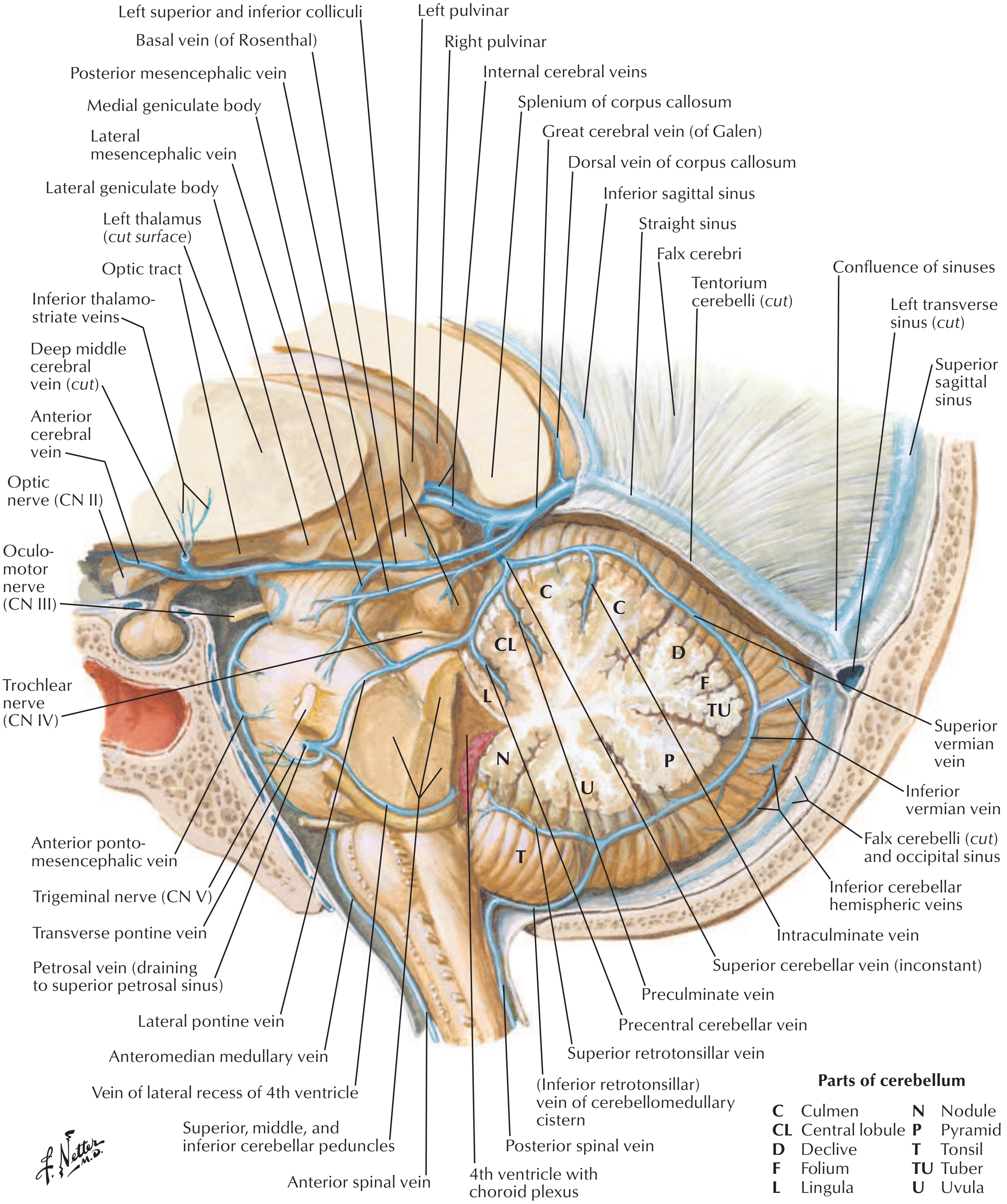
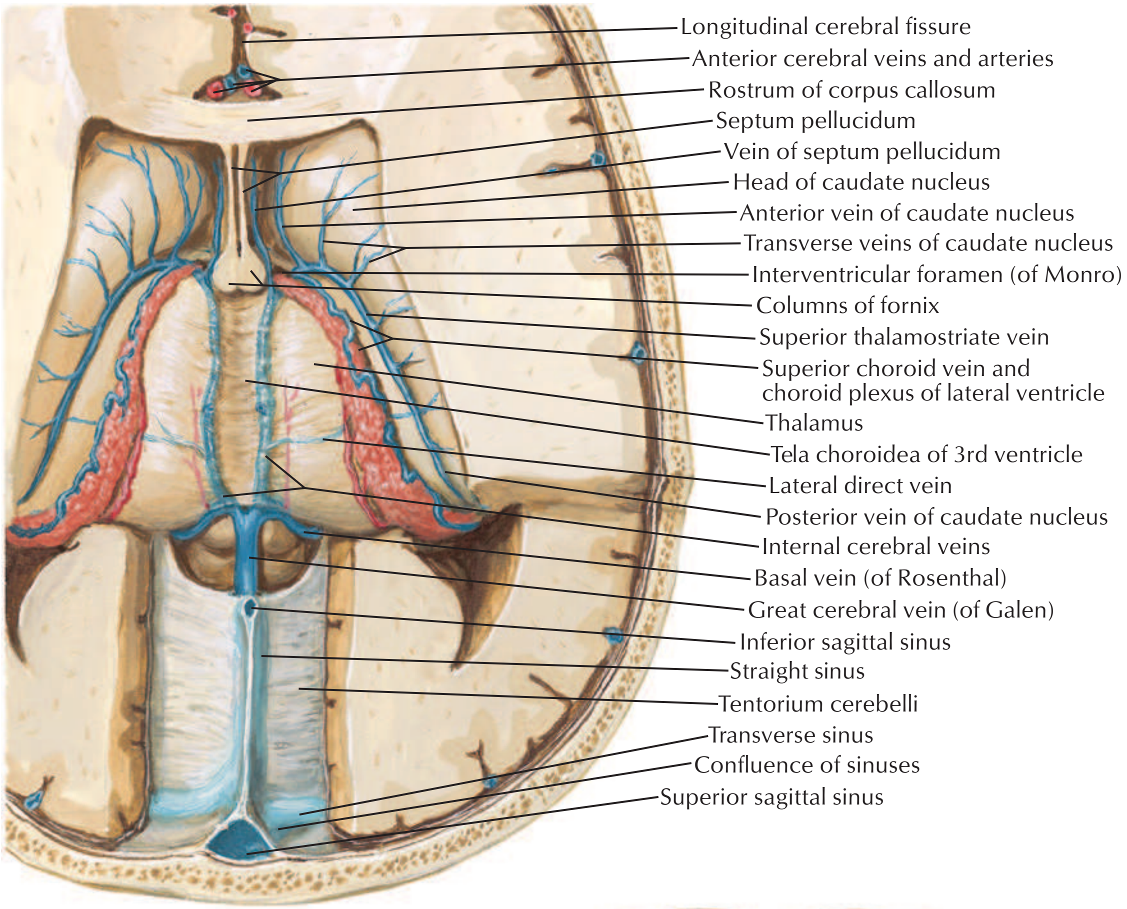

Left superior and inferior colliculi
Basal vein (of Rosenthal)
Posterior mesencephalic vein
Medial geniculate body
Lateral mesencephalic vein
Lateral geniculate body
Left thalamus (*cut surface*)
Optic tract
Inferior thalamostriate veins
Deep middle cerebral vein (*cut*)
Anterior cerebral vein
Optic nerve (CN II)
Oculomotor nerve (CN III)
Trochlear nerve (CN IV)
Anterior pontomesencephalic vein
Trigeminal nerve (CN V)
Transverse pontine vein
Petrosal vein (draining to superior petrosal sinus)
Lateral pontine vein
Anteromedian medullary vein
Vein of lateral recess of 4th ventricle
Superior, middle, and inferior cerebellar peduncles
Anterior spinal vein
4th ventricle with choroid plexus
Posterior spinal vein
(Inferior retrotonsillar) vein of cerebellomedullary cistern
Superior retrotonsillar vein
Precentral cerebellar vein
Preculminate vein
Superior cerebellar vein (inconstant)
Intraculminate vein
Inferior cerebellar hemispheric veins
Falx cerebelli (*cut*) and occipital sinus
Inferior vermian vein
Superior vermian vein
Superior sagittal sinus
Left transverse sinus (*cut*)
Confluence of sinuses
Tentorium cerebelli (*cut*)
Falx cerebri
Straight sinus
Inferior sagittal sinus
Dorsal vein of corpus callosum
Great cerebral vein (of Galen)
Splenium of corpus callosum
Internal cerebral veins
Right pulvinar
Left pulvinar
C
C
CL
D
F
TU
L
N
P
U
T

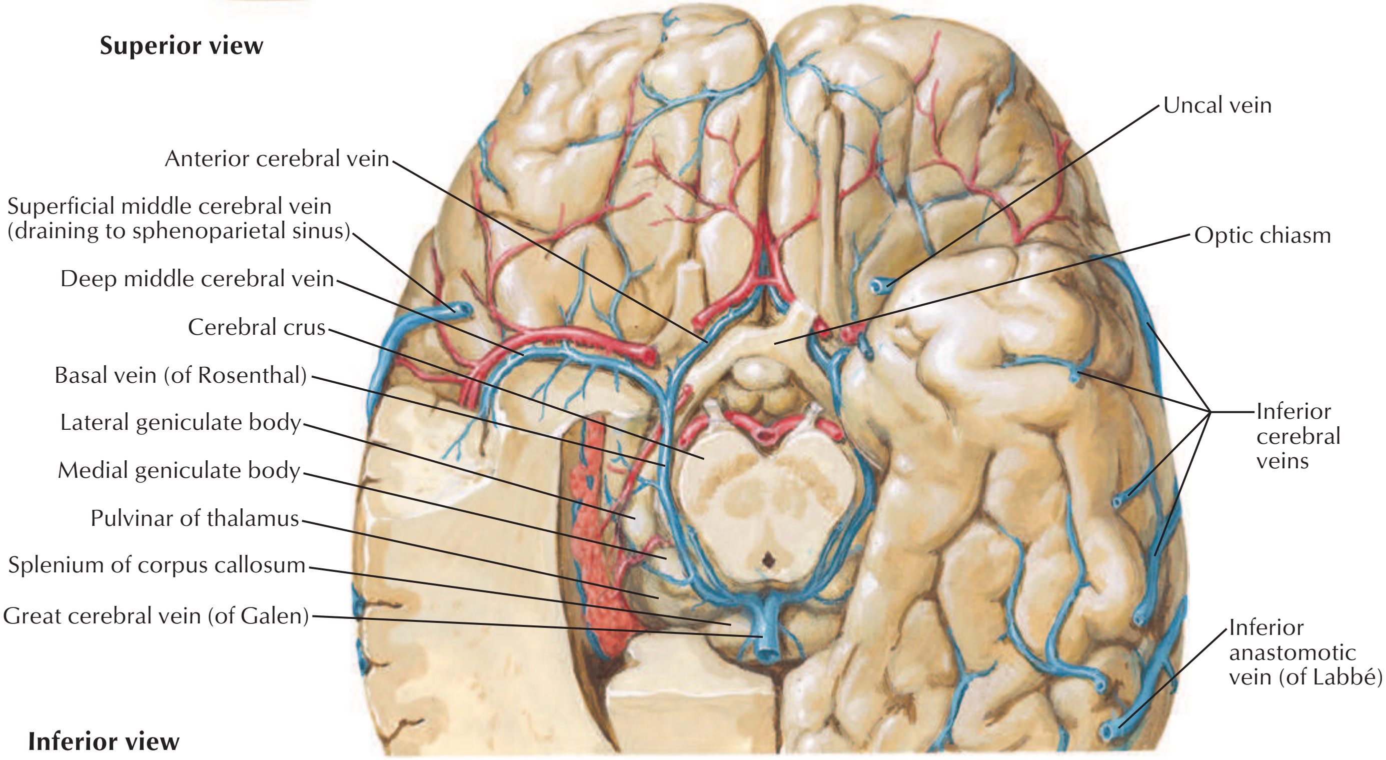
Parts of cerebellum

C	Culmen	**N**	Nodule
CL	Central lobule	**P**	Pyramid
D	Declive	**T**	Tonsil
F	Folium	**TU**	Tuber
L	Lingula	**U**	Uvula

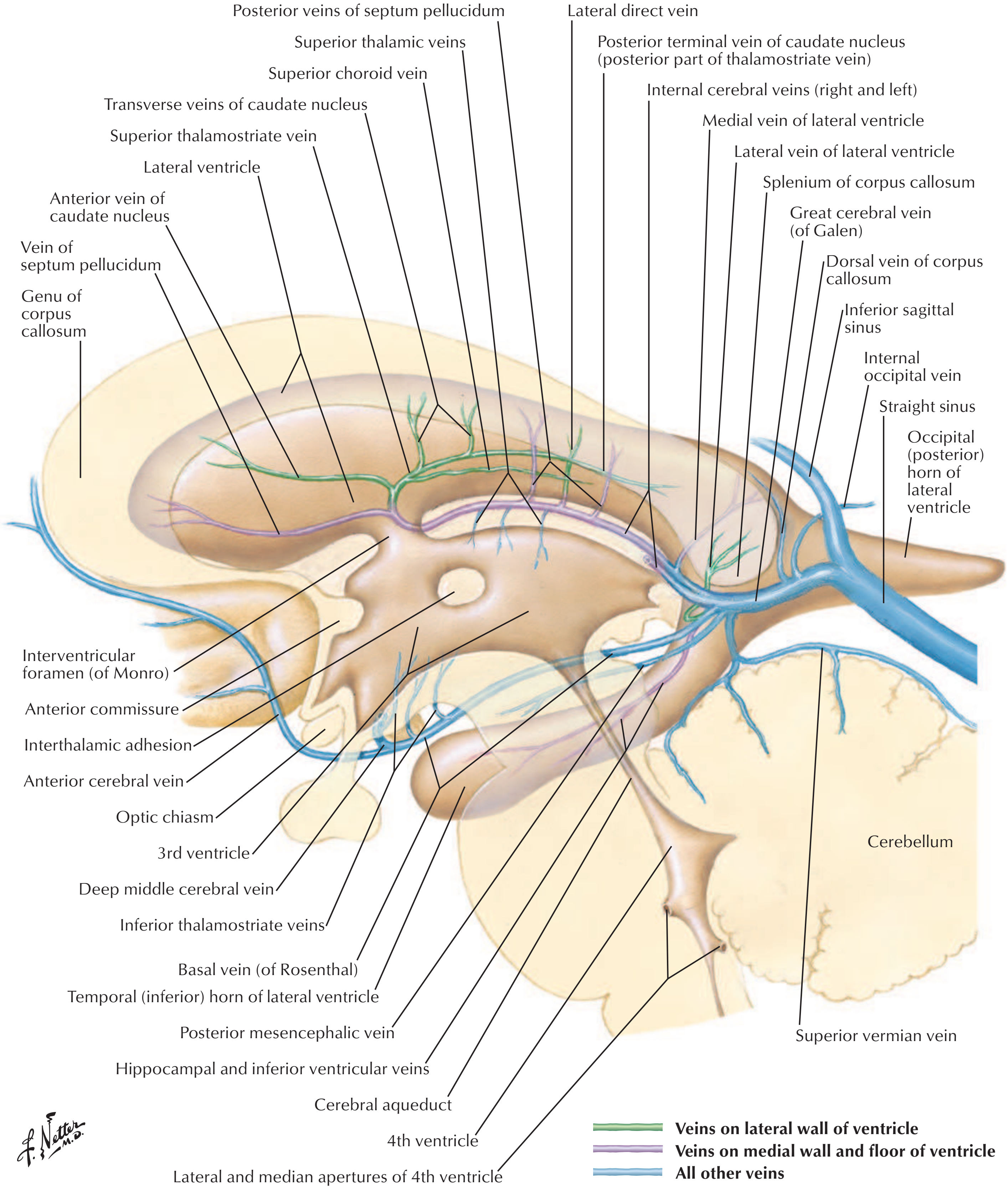
For superficial veins of brain see Plate 122


Longitudinal cerebral fissure
Anterior cerebral veins and arteries
Rostrum of corpus callosum
Septum pellucidum
Vein of septum pellucidum
Head of caudate nucleus
Anterior vein of caudate nucleus
Transverse veins of caudate nucleus
Interventricular foramen (of Monro)
Columns of fornix
Superior thalamostriate vein
Superior choroid vein and choroid plexus of lateral ventricle
Thalamus
Tela choroidea of 3rd ventricle
Lateral direct vein
Posterior vein of caudate nucleus
Internal cerebral veins
Basal vein (of Rosenthal)
Great cerebral vein (of Galen)
Inferior sagittal sinus
Straight sinus
Tentorium cerebelli
Transverse sinus
Confluence of sinuses
Superior sagittal sinus

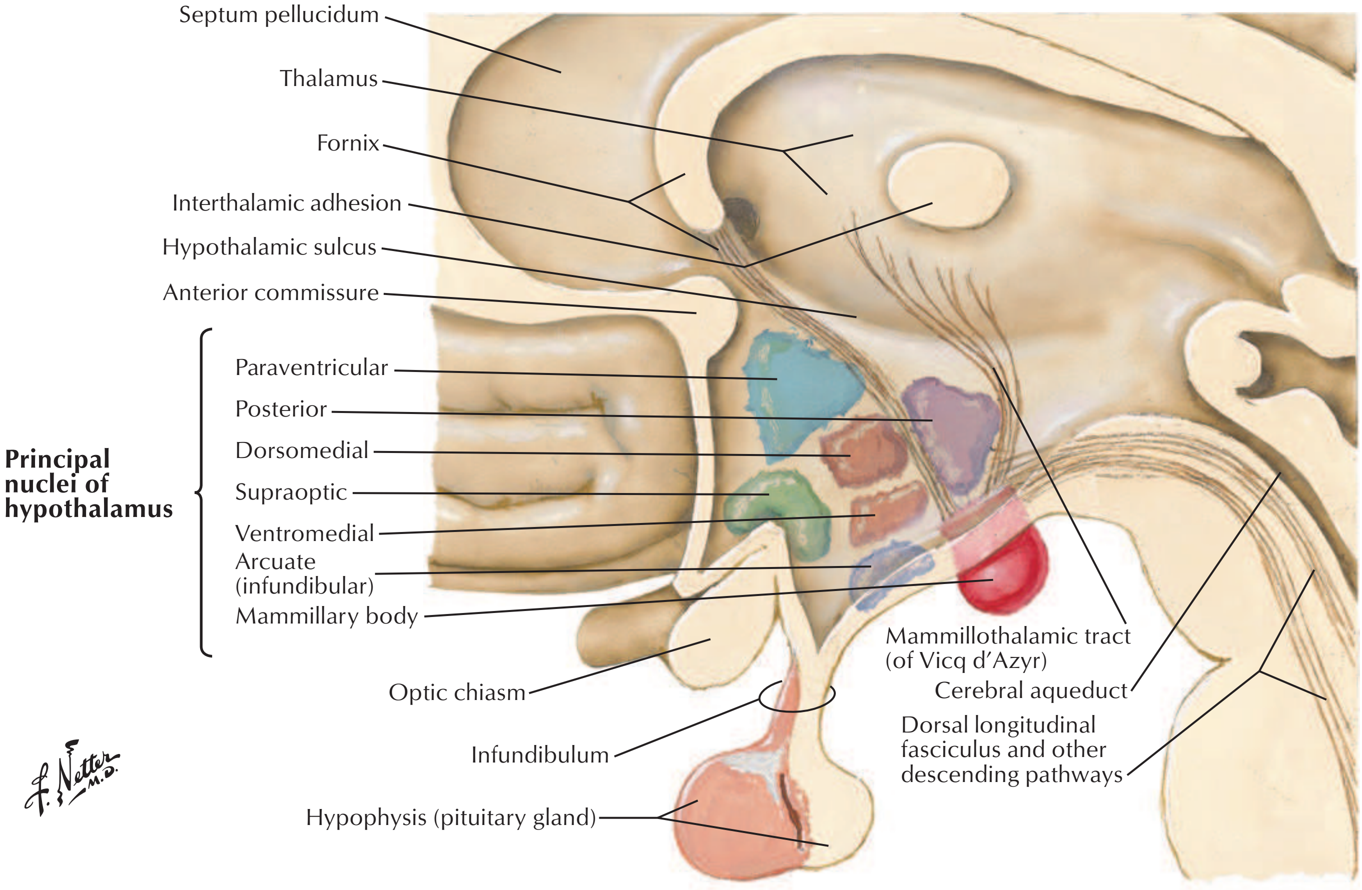
Superior view


F. Netter M.D.
Anterior cerebral vein
Superficial middle cerebral vein (draining to sphenoparietal sinus)
Deep middle cerebral vein
Cerebral crus
Basal vein (of Rosenthal)
Lateral geniculate body
Medial geniculate body
Pulvinar of thalamus
Splenium of corpus callosum
Great cerebral vein (of Galen)
Uncal vein
Optic chiasm
Inferior cerebral veins
Inferior anastomotic vein (of Labbé)

Inferior view


Posterior veins of septum pellucidum
Superior thalamic veins
Superior choroid vein
Transverse veins of caudate nucleus
Superior thalamostriate vein
Lateral ventricle
Anterior vein of caudate nucleus
Vein of septum pellucidum
Genu of corpus callosum
Lateral direct vein
Posterior terminal vein of caudate nucleus (posterior part of thalamostriate vein)
Internal cerebral veins (right and left)
Medial vein of lateral ventricle
Lateral vein of lateral ventricle
Splenium of corpus callosum
Great cerebral vein (of Galen)
Dorsal vein of corpus callosum
Inferior sagittal sinus
Internal occipital vein
Straight sinus
Occipital (posterior) horn of lateral ventricle
Interventricular foramen (of Monro)
Anterior commissure
Interthalamic adhesion
Anterior cerebral vein
Optic chiasm
3rd ventricle
Deep middle cerebral vein
Inferior thalamostriate veins
Basal vein (of Rosenthal)
Temporal (inferior) horn of lateral ventricle
Posterior mesencephalic vein
Hippocampal and inferior ventricular veins
Cerebral aqueduct
4th ventricle
Lateral and median apertures of 4th ventricle
Cerebellum
Superior vermian vein
F. Netter M.D.

🟩 **Veins on lateral wall of ventricle**
🟪 **Veins on medial wall and floor of ventricle**
🟦 **All other veins**


Septum pellucidum
Thalamus
Fornix
Interthalamic adhesion
Hypothalamic sulcus
Anterior commissure
Principal nuclei of hypothalamus
Paraventricular
Posterior
Dorsomedial
Supraoptic
Ventromedial
Arcuate (infundibular)
Mammillary body
Optic chiasm
Infundibulum
Hypophysis (pituitary gland)
Mammillothalamic tract (of Vicq d'Azyr)
Cerebral aqueduct
Dorsal longitudinal fasciculus and other descending pathways
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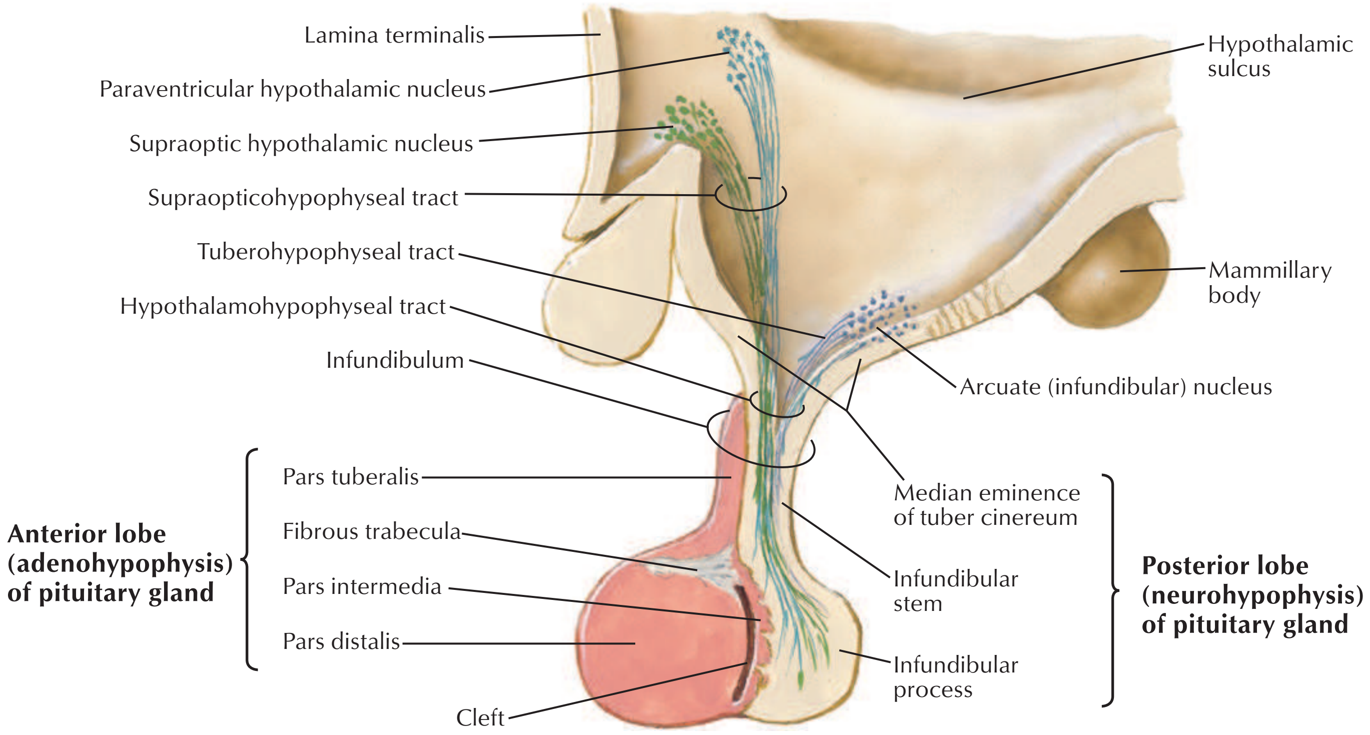
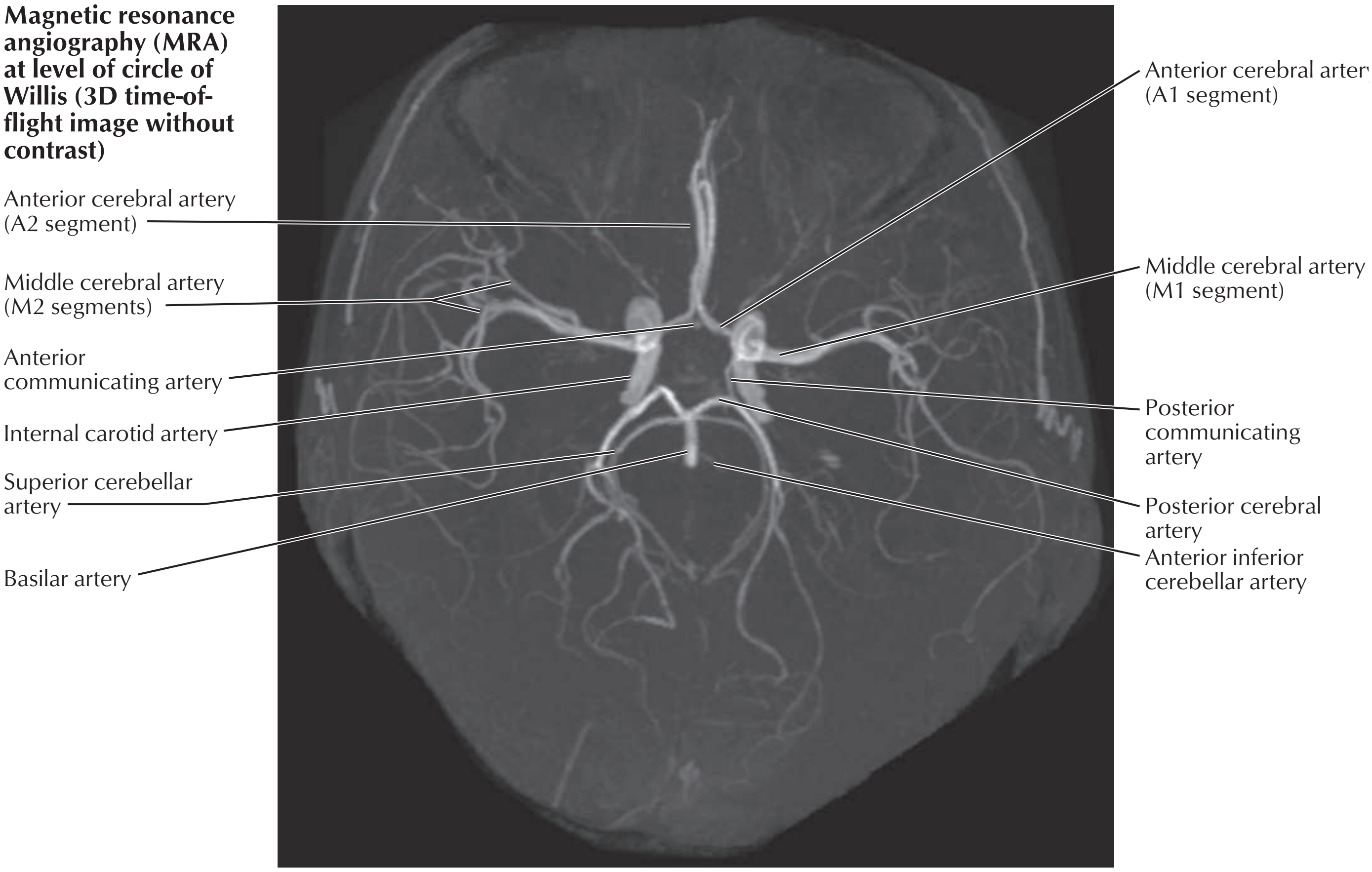
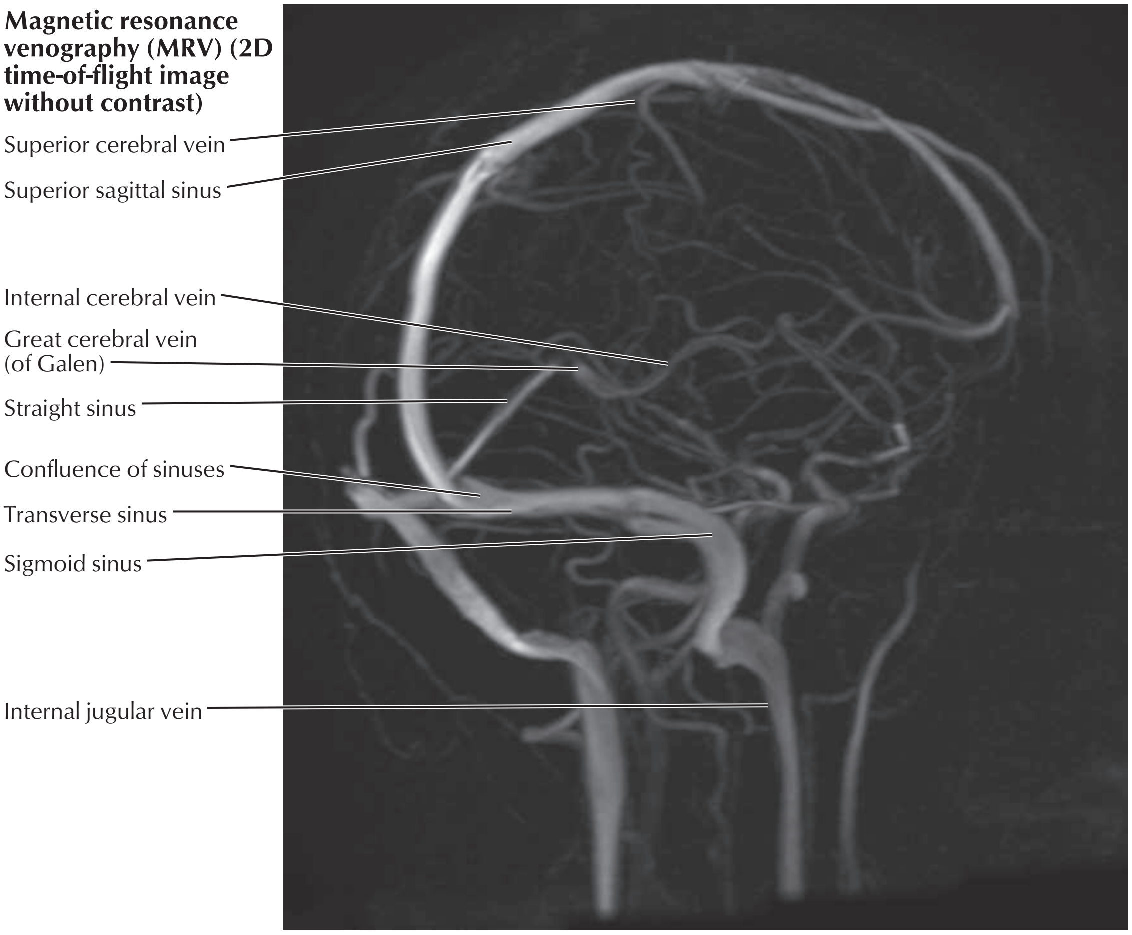

Lamina terminalis
Paraventricular hypothalamic nucleus
Supraoptic hypothalamic nucleus
Supraopticohypophyseal tract
Tuberohypophyseal tract
Hypothalamohypophyseal tract
Infundibulum
Hypothalamic sulcus
Mammillary body
Arcuate (infundibular) nucleus
Anterior lobe (adenohypophysis) of pituitary gland
Pars tuberalis
Fibrous trabecula
Pars intermedia
Pars distalis
Cleft
Median eminence of tuber cinereum
Infundibular stem
Infundibular process
Posterior lobe (neurohypophysis) of pituitary gland

Cranial Imaging (MRA and MRV)

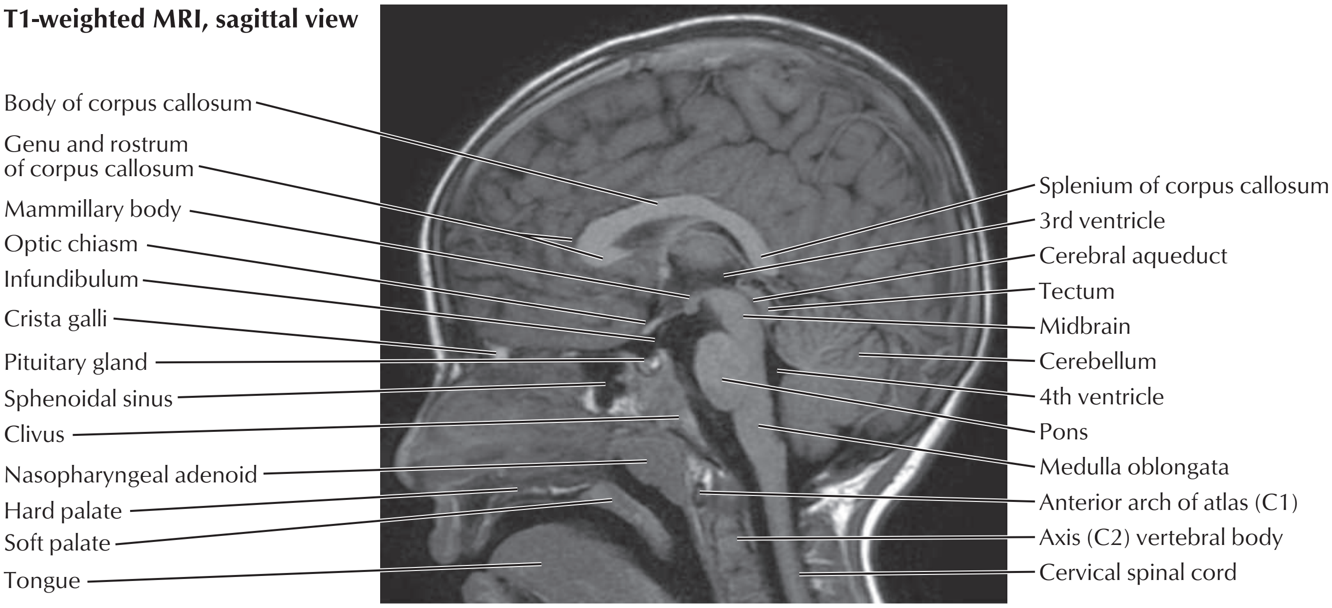
Magnetic resonance angiography (MRA) at level of circle of Willis (3D time-of-flight image without contrast)


Anterior cerebral artery (A2 segment)
Middle cerebral artery (M2 segments)
Anterior communicating artery
Internal carotid artery
Superior cerebellar artery
Basilar artery
Anterior cerebral arter
(A1 segment)
Middle cerebral artery (M1 segment)
Posterior communicating artery
Posterior cerebral artery
Anterior inferior cerebellar artery

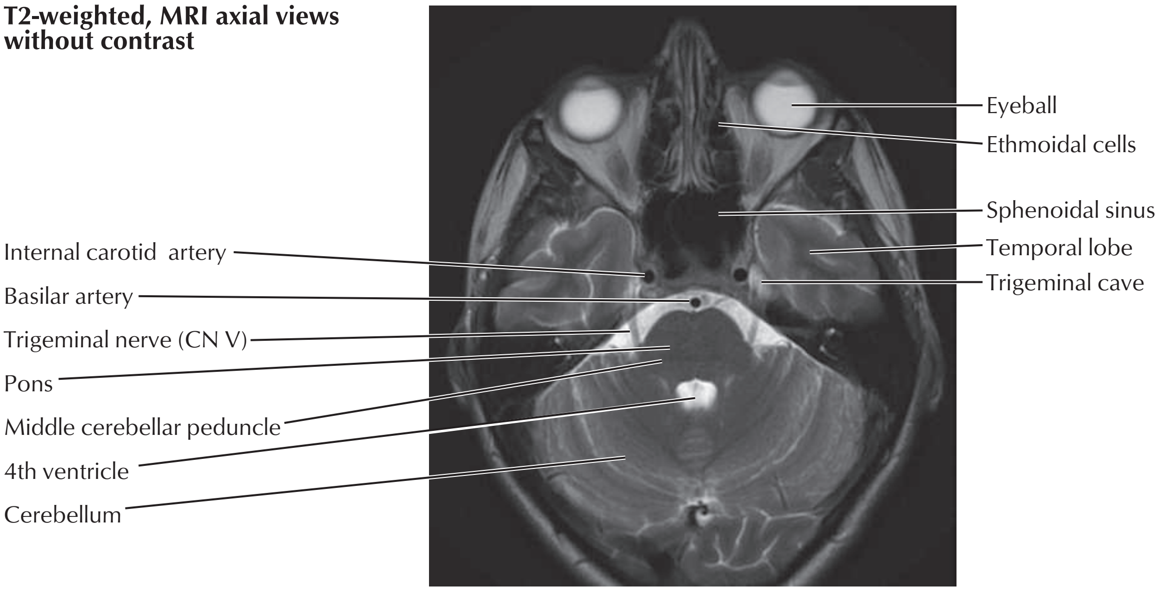
Magnetic resonance venography (MRV) (2D time-of-flight image without contrast)

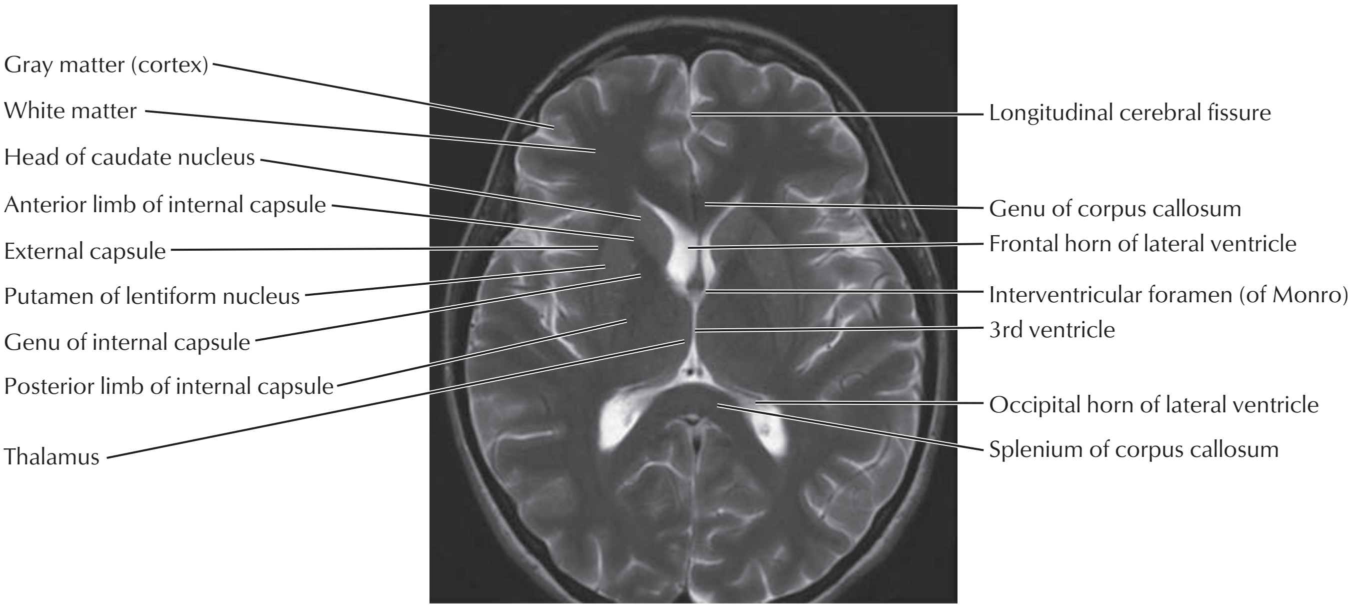

Superior cerebral vein
Superior sagittal sinus
Internal cerebral vein
Great cerebral vein (of Galen)
Straight sinus
Confluence of sinuses
Transverse sinus
Sigmoid sinus
Internal jugular vein

T1-weighted MRI, sagittal view


Body of corpus callosum
Genu and rostrum of corpus callosum
Mammillary body
Optic chiasm
Infundibulum
Crista galli
Pituitary gland
Sphenoidal sinus
Clivus
Nasopharyngeal adenoid
Hard palate
Soft palate
Tongue
Splenium of corpus callosum
3rd ventricle
Cerebral aqueduct
Tectum
Midbrain
Cerebellum
4th ventricle
Pons
Medulla oblongata
Anterior arch of atlas (C1)
Axis (C2) vertebral body
Cervical spinal cord

T2-weighted, MRI axial views without contrast


Eyeball
Ethmoidal cells
Sphenoidal sinus
Temporal lobe
Trigeminal cave
Internal carotid artery
Basilar artery
Trigeminal nerve (CN V)
Pons
Middle cerebellar peduncle
4th ventricle
Cerebellum


Gray matter (cortex)
White matter
Head of caudate nucleus
Anterior limb of internal capsule
External capsule
Putamen of lentiform nucleus
Genu of internal capsule
Posterior limb of internal capsule
Thalamus
Longitudinal cerebral fissure
Genu of corpus callosum
Frontal horn of lateral ventricle
Interventricular foramen (of Monro)
3rd ventricle
Occipital horn of lateral ventricle
Splenium of corpus callosum

ANATOMIC STRUCTURES	CLINICAL IMPORTANCE	PLATE NUMBERS
SKELETAL SYSTEM		
Orbit	Direct trauma to eye may result in “blowout” fracture; margin remains intact, but medial and/or inferior walls of orbit have fractured	11, 50
Pterion	Weak area of skull that is common site of fracture	13
Temporomandibular joint	Temporomandibular disorders are common source of pain and joint dysfunction	25
Cervical vertebrae	Degenerative changes cause narrowing of intervertebral foramina that may cause cervical radiculopathy	26–28
Cervical vertebrae	Bilateral fracture of pars interarticularis of C2 (spondylolysis) results from hyperextension of head on neck and results in spondylolisthesis of C2 (hangman’s fracture); fractures (common) are due to motor vehicle, snowmobile, and all-terrain vehicle accidents	26
Thyroid cartilage, cricoid cartilage	Palpable landmarks used for cricothyrotomy and tracheostomy	87, 90
Ear ossicles	Pathologic conditions involving ossicles (e.g., otosclerosis) can cause conductive hearing loss	105, 106
MUSCULAR SYSTEM		
Muscles of facial expression	Used to assess function of CN VII during cranial nerve examination; may become weak or paralyzed with CN VII dysfunction (e.g., Bell’s palsy)	31, 134
Sternocleidomastoid muscle	Palpated to identify “nerve point of neck” for administration of anesthesia to cervical plexus	39
Sternocleidomastoid, trapezius muscles	Used to assess function of CN XI during cranial nerve examination	39, 138
Muscles of mastication	Used to assess function of CN V (V_3) during cranial nerve examination	55, 56
Levator veli palatini, musculus uvulae	Used to assess function of CN X during cranial nerve examination; contralateral deviation of uvula during elevation indicates CN X dysfunction	67
Genioglossus muscle	Used to assess CN XII function during cranial nerve examination; deviates to side of lesion when protruded following CN XII injury	70, 139
Levator palpebrae superioris, superior tarsal muscles	Muscles responsible for elevating eyelid; ptosis indicates pathologic change in CN III or sympathetics (superior tarsal muscle)	94, 96
Eye muscles	Used to assess function of CN III, CN IV, and CN VI during cranial nerve examination	96, 98
Dilator pupillae muscle	Important in assessment of sympathetic function in head; lack of dilation indicates interruption in sympathetic outflow (e.g., Horner’s syndrome)	101, 132
Sphincter pupillae muscle	Involved in pupillary light reflex and accommodation reflex	101, 132
RESPIRATORY SYSTEM		
Paranasal sinuses	Cavities in skull; prone to mucosal inflammation due to bacterial or viral infection	49, 50
DIGESTIVE SYSTEM		
Parotid gland	Swelling of gland due to infection (e.g., mumps) may compress branches of facial nerve, producing facial muscle weakness	53, 54

ANATOMIC STRUCTURES	CLINICAL IMPORTANCE	PLATE NUMBERS
ENDOCRINE SYSTEM		
Thyroid gland	Common site of cancer; removed with thyroidectomy	87
NERVOUS SYSTEM		
Accessory nerve (CN XI)	Lymph node biopsy in posterior cervical triangle can cause iatrogenic injury of CN XI	39
Cervical plexus	Cervical plexus blocks are performed for neck procedures	39, 40
Trigeminal nerve (CN V)	Branches of CN V are anesthetized for procedures on face or anterior scalp	42, 133
Olfactory nerve (CN I)	One of most commonly injured cranial nerves; can be avulsed at cribriform plate following falls	46, 130
Facial nerve (CN VII)	Idiopathic unilateral facial nerve palsy (Bell's palsy) can result in inability to fully close eye and result in desiccated cornea ipsilaterally	54
Recurrent laryngeal nerve	May be compressed or damaged by procedures in neck (e.g., thyroidectomy), aortic arch aneurysm, or lung cancer, producing hoarseness of voice	88, 89
Oculomotor nerve (CN III), trochlear nerve (CN IV), and abducens nerve (CN VI)	Cavernous sinus thrombosis can result in dysfunction of extraocular muscles caused by compression of one, two, or all three nerves	115
Superior colliculus and cerebral aqueduct	Tumor of midbrain can result in compression of cerebral aqueduct, with resultant hydrocephalus	120
Optic nerve (CN II)	One early sign of growing pituitary gland mass is bitemporal hemianopsia	131, 151
Optic nerve (CN II)	One of first signs of ophthalmic artery aneurysm is visual loss due to compression of overlying optic nerve	148
CARDIOVASCULAR SYSTEM		
Right internal and external jugular veins	Examined to assess jugular venous pulse; internal jugular vein is preferred because it is in line with superior vena cava; external jugular vein may be used instead as the internal jugular vein is very difficult to visualize	38
Internal jugular vein, subclavian vein	Used to obtain venous access via insertion of central venous catheter	38, 84
Inferior thyroid artery	At risk during thyroidectomy; must be preserved to maintain blood supply to parathyroid glands	40, 88
Common carotid artery	Palpated in neck to assess carotid pulse; prone to atherosclerotic thickening of vessel wall	41
Anterior ethmoidal, sphenopalatine, and facial arteries	Anastomosis site of these vessels in nasal vestibule is common site of nosebleed (epistaxis)	47
Pterygoid venous plexus	Common route for spread of infection due to connections between face, orbit, and venous sinuses	84, 99
Ophthalmic artery	Primary source of blood to retina; blindness may occur if artery is occluded	99, 103
Arteries of scalp	Lacerations bleed profusely owing to rich blood supply; vessels do not retract in dense connective tissue layer of scalp	111
Superior cerebral veins	May be torn from their junction with superior sagittal sinus, producing subdural hematoma	112, 113, 114, 120

ANATOMIC STRUCTURES	CLINICAL IMPORTANCE	PLATE NUMBERS
CARDIOVASCULAR SYSTEM—Continued		
Middle meningeal artery	Trauma to skull can tear middle meningeal artery, causing epidural hematoma	112
Dural venous sinuses	Infections in head may spread to sinuses, causing dural sinus thrombosis; cavernous sinus is most common site	114, 115
Cavernous sinus	Fistula (anastomosis) between internal carotid artery and cavernous sinus may form, especially following trauma	115, 151
Carotid sinus	Compressed during carotid sinus massage	141
Cerebral arterial circle of Willis	Common site of aneurysms; rupture produces subarachnoid hemorrhage	150
LYMPHATIC SYSTEM		
Thoracic duct	May be injured in neck at junction of internal jugular and subclavian veins	85
Superior and inferior deep nodes	Palpated during neck examination to assess size	85, 86

*Selections were based largely on clinical data and commonly discussed clinical correlations in gross anatomy courses.

MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Auricularis anterior	External ear	Temporal fascia, epicranial aponeurosis	Anterior part of medial surface of helix of ear	Posterior auricular and temporal branches of facial nerve	Auricular branch of posterior auricular artery, parietal branch of superficial temporal artery	Elevates and draws auricle forward
Auricularis posterior	External ear	Base of mastoid process	Lower part of cranial surface of auricle	Posterior auricular and temporal branches of facial nerve	Auricular branch of posterior auricular artery, parietal branch of superficial temporal artery	Retracts and elevates auricle
Auricularis superior	External ear	Temporal fascia, epicranial aponeurosis	Upper part of medial surface of auricle	Posterior auricular and temporal branches of facial nerve	Auricular branch of posterior auricular artery, parietal branch of superficial temporal artery	Retracts and elevates auricle
Buccinator	Facial expression	Posterior portion of alveolar process of maxillary bone and mandible opposite sockets of molar teeth, anterior border of pterygomandibular raphe	Angle of mouth	Buccal branches of facial nerve	Muscular branches of facial artery, buccal branch of maxillary artery	Compresses cheeks, expels air between lips, aids in mastication
Ciliary	Intrinsic eye	Corneoscleral junction	Ciliary body	Parasympathetic fibers via short ciliary nerves (CN III)	Ophthalmic artery	Constricts ciliary body and lens rounds up (accommodation)
Corrugator supercilii	Facial expression	Medial part of supraorbital margin	Skin of medial half of eyebrow	Zygomatic and temporal branches of facial nerve	Zygomatic and anterior branches of superficial temporal artery	Draws eyebrows downward and medially, produces vertical wrinkles of skin between eyebrows
Cricothyroid	Laryngeal	Anterior cricoid cartilage	Inferior border of thyroid cartilage and its inferior horn	External branch of superior laryngeal nerve	Superior and inferior thyroid arteries	Lengthens and tenses vocal ligaments
Depressor anguli oris	Facial expression	Continuous with platysma muscle on oblique line of mandible	Angle of mouth into orbicularis oris muscle and skin	Mandibular and buccal branches of facial nerve	Inferior labial artery of facial artery	Depresses angle of mouth
Depressor labii inferioris	Facial expression	Lateral surface of mandible between symphysis and mental foramen deep to depressor anguli oris	Skin to lower lip, mingling with orbicularis oris muscle, medial fibers joining those of opposite side	Mandibular and buccal branches of facial nerve	Inferior labial artery of facial artery	Depresses lower lip and draws it lateralward
Depressor septi nasi	Facial expression	Incisive fossa of maxillary bone	Septum and posterior part of ala of nose	Zygomatic and buccal branches of facial nerve	Superior labial artery of facial artery	Narrows nostril, draws septum downward
Digastric	Suprahyoid	*Anterior belly:* digastric fossa of mandible *Posterior belly*: mastoid notch of temporal bone	Intermediate tendon attached to body of hyoid	*Anterior belly:* nerve to mylohyoid muscle *Posterior belly:* facial nerve	*Anterior belly:* branches of submental artery *Posterior belly:* muscular branches of posterior auricular artery, muscular branches of occipital artery	Raises hyoid bone and base of tongue, steadies hyoid bone, opens mouth by lowering mandible
Dilator pupillae	Intrinsic eye	Radial fibers in iris	Blends with sphincter pupillae fibers	Sympathetic fibers from superior cervical ganglion	Ophthalmic artery	Dilates pupil
Frontal belly of occipitofrontalis	Facial expression	Epicranial aponeurosis at level of coronal suture	Skin of frontal region, epicranial aponeurosis	Temporal branches of facial nerve	Frontal branch of superficial temporal artery	Horizontally wrinkles skin of forehead, raises eyebrows
Genioglossus	Extrinsic tongue	Mental spine of mandible	Dorsum of tongue, hyoid bone	Hypoglossal nerve (CN XII)	Sublingual and submental arteries	Depresses and protrudes tongue

Variations in spinal nerve contributions to the innervation of muscles, their arterial supply, their attachments, and their actions are common themes in human anatomy. Therefore, expect differences between texts and realize that anatomical variation is normal.

MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Geniohyoid	Suprahyoid	Inferior genial tubercle on back of symphysis of mandible	Anterior surface of body of hyoid bone	Branch of C1 through hypoglossal nerve (CN XII)	Sublingual branch of lingual artery	Elevates hyoid bone and depresses mandible
Hyoglossus	Extrinsic tongue	Body and greater horn of hyoid bone	Lateral and inferior aspect of tongue	Hypoglossal nerve (CN XII)	Sublingual and submental arteries	Depresses and retracts tongue
Inferior longitudinal lingual muscle	Intrinsic tongue	Under surface of tongue between genioglossus and hyoglossus	Apex of tongue blending with styloglossus	Hypoglossal nerve (CN XII)	Deep lingual branch of lingual artery, branches from facial artery	Shortens tongue, turns tip and sides downward
Inferior oblique	Extraocular; eyelid	Anterior floor of orbit lateral to nasolacrimal canal	Lateral sclera deep to lateral rectus muscle	Oculomotor nerve (CN III), inferior division	Ophthalmic artery	Abducts, elevates, and laterally rotates eyeball
Inferior pharyngeal constrictor	Circular pharyngeal	Oblique line of thyroid cartilage and cricoid cartilage	Median raphe of pharynx	Vagus nerve via pharyngeal plexus	Ascending pharyngeal artery, branches of superior thyroid artery	Constricts wall of pharynx during swallowing
Inferior rectus	Extraocular; eyelid	Common tendinous ring	Inferior aspect of eyeball, posterior to corneoscleral junction	Oculomotor nerve (CN III), inferior division	Ophthalmic artery	Depresses, adducts, and laterally rotates eyeball
Lateral cricoarytenoid	Laryngeal	Arch of cricoid cartilage	Muscular process of arytenoid cartilage	Recurrent laryngeal nerve	Superior and inferior thyroid arteries	Adducts vocal folds
Lateral pterygoid	Mastication	*Superior head:* infratemporal surface of greater wing of sphenoid bone *Inferior head:* lateral pterygoid plate	Pterygoid fovea, capsule of temporomandibular joint, articular disc	Mandibular nerve (CN V_3)	Muscular branches of maxillary artery	*Bilaterally:* protrudes mandible *Unilaterally and alternately:* produces side-to-side grinding
Lateral rectus	Extraocular; eyelid	Common tendinous ring	Lateral aspect of eyeball, posterior to corneoscleral junction	Abducens nerve (CN VI)	Ophthalmic artery	Abducts eyeball
Levator anguli oris	Facial expression	Canine fossa of maxillary bone immediately below infra-orbital foramen and under cover of zygomatic head of levator labii superioris	Angle of mouth; fibers intermingle with orbicularis oris, depressor anguli oris, zygomaticus	Zygomatic and buccal branches of facial nerve	Superior labial artery of facial artery	Elevates angle of mouth
Levator labii superioris alaeque nasi	Facial expression	Upper part of frontal process of maxillary bone	Into major alar cartilage, skin of nose, lateral upper lip	Zygomatic and buccal branches of facial nerve	Superior labial artery and angular branches of facial artery	Elevates upper lip and dilates nostril
Levator labii superioris	Facial expression	Maxillary bone above infraorbital foramen	Skin of upper lip	Zygomatic and buccal branches of facial nerve	Superior labial artery and angular branches of facial artery	Elevates upper lip, dilates nares
Levator palpebrae superioris	Extraocular; eyelid	Lesser wing of sphenoid bone, anterior to optic canal	Superior tarsal plate	Oculomotor nerve (CN III), superior division	Ophthalmic artery	Raises upper eyelid
Levator veli palatini	Palatal	Temporal bone (petrous portion) and auditory tube	Palatine aponeurosis	Vagus nerve via pharyngeal plexus	Ascending palatine artery branch of facial artery, descending palatine artery branch of maxillary artery	Elevates soft palate during swallowing

MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Longus capitis	Anterior vertebral	Anterior tubercles of transverse processes of C3–C6	Inferior surface of basilar part of occipital bone	Anterior rami of cervical nerves (C1–C3)	Ascending cervical branch of inferior thyroid artery, ascending pharyngeal artery, muscular branches of vertebral artery	Flexes head
Longus colli	Anterior vertebral	*Vertical portion:* C5–T3 vertebrae *Inferior oblique portion:* T1–T3 vertebrae *Superior oblique portion*: anterior tubercles of transverse processes of C3–C5 vertebrae	*Vertical portion:* into C2–C4 vertebrae *Inferior oblique portion*: on anterior tubercles of transverse processes of C3–C6 vertebrae *Superior oblique portion:* tubercle of anterior arch of atlas	Anterior primary rami of cervical nerves (C2–C8)	Prevertebral branches of ascending pharyngeal artery, muscular branches of ascending cervical and vertebral arteries	*Bilaterally*: flex and assist in rotating cervical vertebrae and head *Unilaterally:* flexes vertebral column laterally
Masseter	Mastication	Zygomatic arch	Ramus of mandible, coronoid process	Mandibular nerve (CN V_3), via masseteric nerve	Transverse facial artery; masseteric branch of maxillary and facial arteries	Elevates and protrudes mandible; deep fibers retract it
Medial pterygoid	Mastication	Medial surface of lateral plate of pterygoid, pyramidal process of palatine bone, maxillary tuberosity	Medial surface of ramus and angle of mandible inferior to mandibular foramen	Mandibular nerve (V_3), nerve to medial pterygoid muscle	Facial and maxillary arteries	*Bilaterally:* protrudes and elevates mandible *Unilaterally and alternately:* produces side-to-side movements
Medial rectus	Extraocular; eyelid	Common tendinous ring	Medial aspect of eyeball, posterior to corneoscleral junction	Oculomotor nerve (CN III), inferior division	Ophthalmic artery	Adducts eyeball
Mentalis	Facial expression	Incisive fossa of mandible	Skin of chin	Marginal mandibular branch of facial nerve	Inferior labial artery of facial artery	Raises and protrudes lower lip
Middle pharyngeal constrictor	Circular pharyngeal	Stylohyoid ligament and horns of hyoid bone	Median raphe of pharynx	Vagus nerve via pharyngeal plexus	Ascending pharyngeal artery, ascending palatine and tonsillar branches of facial artery, dorsal lingual branches of lingual artery	Constricts wall of pharynx during swallowing
Musculus uvulae	Palatal	Nasal spine, palatine aponeurosis	Mucosa of uvula of the palate	Vagus nerve via pharyngeal plexus	Ascending palatine artery branch of facial artery, descending palatine artery branch of maxillary artery	Shortens, elevates, and retracts uvula of the palate
Mylohyoid	Suprahyoid	Mylohyoid line of mandible	Median raphe and body of hyoid bone	Nerve to mylohyoid muscle	Sublingual branch of lingual artery, submental branch of facial artery	Elevates hyoid bone, base of tongue, floor of mouth; depresses mandible
Nasalis	Facial expression	Canine eminence above and lateral to incisive fossa of maxillary bone	Aponeurosis on nasal cartilages	Zygomatic and buccal branches of facial nerve	Superior labial, septal, and lateral nasal branches of facial artery	Draws ala of nose toward nasal septum, compresses nostrils; alar part opens nostrils
Occipital belly (occipitofrontalis) muscle	Facial expression	Lateral 2/3 of superior nuchal line and mastoid process	Skin of occipital region, epicranial aponeurosis	Posterior auricular nerve of facial nerve	Occipital branch of posterior auricular artery, descending branch of occipital artery	Moves scalp backward

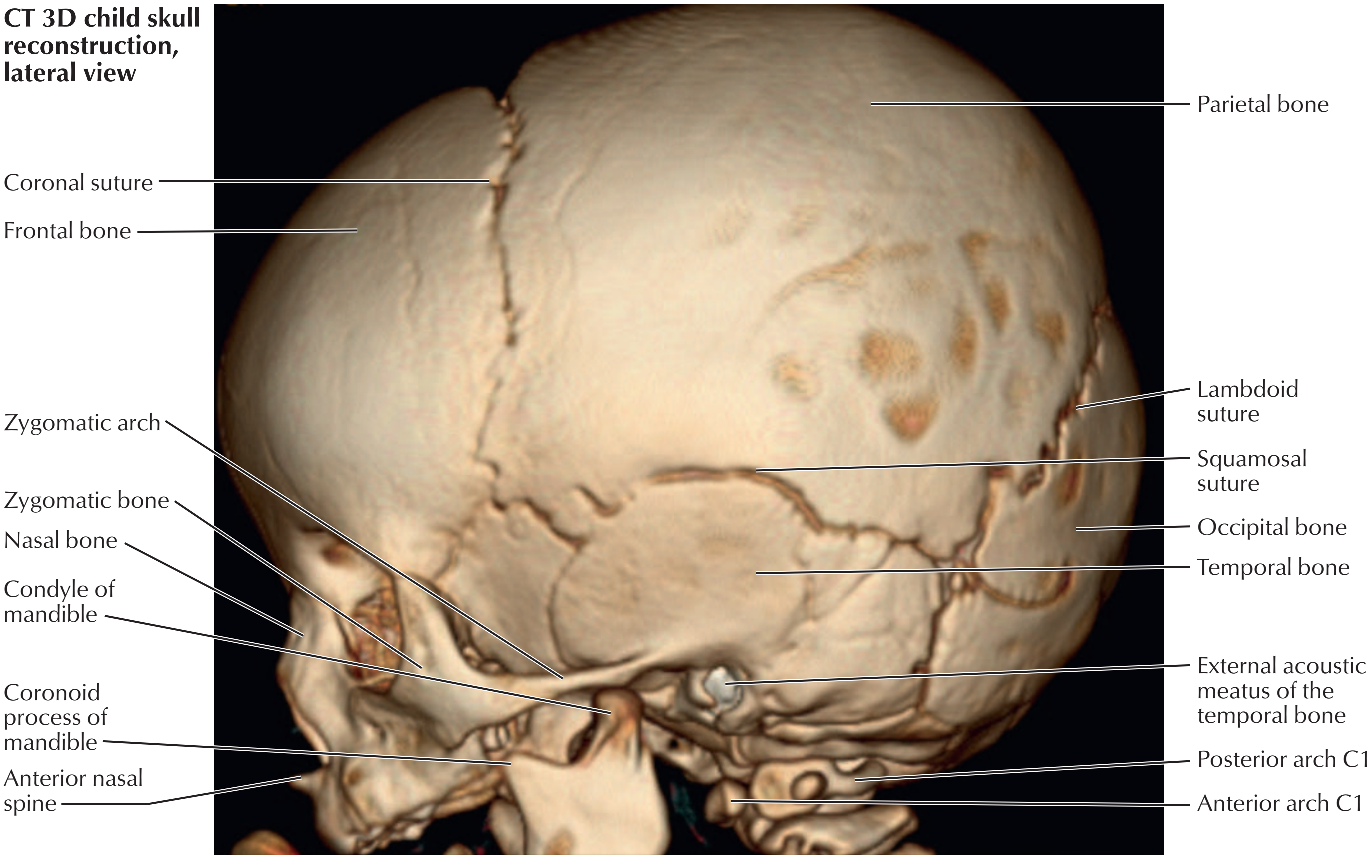
MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Omohyoid	Infrahyoid	*Inferior belly:* from upper border of scapula and superior transverse scapular ligament, ending in intermediate tendon *Superior belly:* from this tendon	*Inferior belly:* to intermediate tendon *Superior belly:* to body of hyoid bone	Ansa cervicalis	Hyoid branch of lingual artery, sternocleidomastoid branch of superior thyroid artery	Steadies hyoid bone and depresses hyoid
Orbicularis oculi	Facial expression	Medial orbital margin, palpebral ligament, lacrimal bone	Skin around orbit, palpebral ligament, upper and lower eyelids	Facial nerve (CN VII)	Facial and superficial temporal arteries	Closes eyelids
Orbicularis oris	Facial expression	Maxillary bone above incisor teeth	Skin around lips	Zygomatic, buccal, and mandibular branches of facial nerve	Inferior and superior labial branches of facial artery	Compression, contraction, and protrusion of lips
Palatoglossus	Palatal	Palatine aponeurosis of soft palate	Lateral aspect of tongue	Vagus nerve via pharyngeal plexus	Ascending pharyngeal arteries, palatine branches of facial and maxillary arteries	Elevates posterior tongue, depresses palate
Palatopharyngeus	Longitudinal pharyngeal	Hard palate, superior palatine aponeurosis	Lateral pharyngeal wall	Vagus nerve via pharyngeal plexus	Ascending palatine artery branch of facial artery, descending palatine artery branch of maxillary artery	Tenses soft palate; pulls walls of pharynx superiorly, anteriorly, and medially during swallowing
Platysma	Facial expression	Skin below clavicle, upper thorax	Mandible, oral muscles	Facial nerve	Submental and suprascapular arteries	Tenses skin of neck
Posterior cricoarytenoid	Laryngeal	Posterior surface of lamina of cricoid cartilage	Muscular process of arytenoid cartilage	Recurrent laryngeal nerve	Superior and inferior thyroid arteries	Abducts vocal folds
Procerus	Facial expression	Fascia covering lower parts of nasal bone and upper part of lateral nasal cartilage	Skin between and above eyebrows	Temporal and zygomatic branches of facial nerve	Angular and lateral nasal branches of facial artery	Draws down medial angle of eyebrows, produces transverse wrinkles over bridge of nose
Rectus capitis anterior	Anterior vertebral	Lateral mass of atlas	Base of occipital bone in front of foramen magnum	Anterior rami of cervical nerves (C1–C2)	Muscular branches of vertebral artery, ascending pharyngeal artery	Flexes head
Rectus capitis lateralis	Anterior vertebral	Upper surface of transverse process of atlas	Inferior surface of jugular process of occipital bone	Anterior rami of cervical nerves (C1–C2)	Muscular branches of vertebral artery, occipital artery, ascending pharyngeal artery	Flexes head laterally to same side
Risorius	Facial expression	Fascia over masseter muscle superficial to platysma muscle	Skin at angle of mouth	Zygomatic and buccal branches of facial nerve	Superior labial artery of facial artery	Retracts angle of mouth
Salpingopharyngeus	Longitudinal pharyngeal	Pharyngotympanic (auditory, eustachian) tube	Side of pharyngeal wall	Vagus nerve via pharyngeal plexus	Pharyngeal branch of ascending pharyngeal artery	Elevates pharynx and larynx during swallowing and speaking
Scalenus anterior	Lateral vertebral	Anterior tubercles of transverse processes of C3–C6	Scalene tubercle on 1st rib	Anterior rami of cervical nerves (C5–C8)	Ascending cervical branch of inferior thyroid artery	Elevates 1st rib, bends neck
Scalenus medius	Lateral vertebral	Posterior tubercles of transverse processes of C2–C7	Upper surface of 1st rib (behind subclavian groove)	Anterior rami of cervical nerves (C3–C7)	Muscular branches of ascending cervical artery	Elevates 1st rib, bends neck
Scalenus posterior	Lateral vertebral	Posterior tubercles of transverse processes of C4–C6	Outer surface of 2nd rib	Anterior rami of cervical nerves (C5–C8)	Muscular branches of ascending cervical division of inferior thyroid artery, superficial branch of transverse cervical artery	Elevates 2nd rib, bends neck

Table 2.7

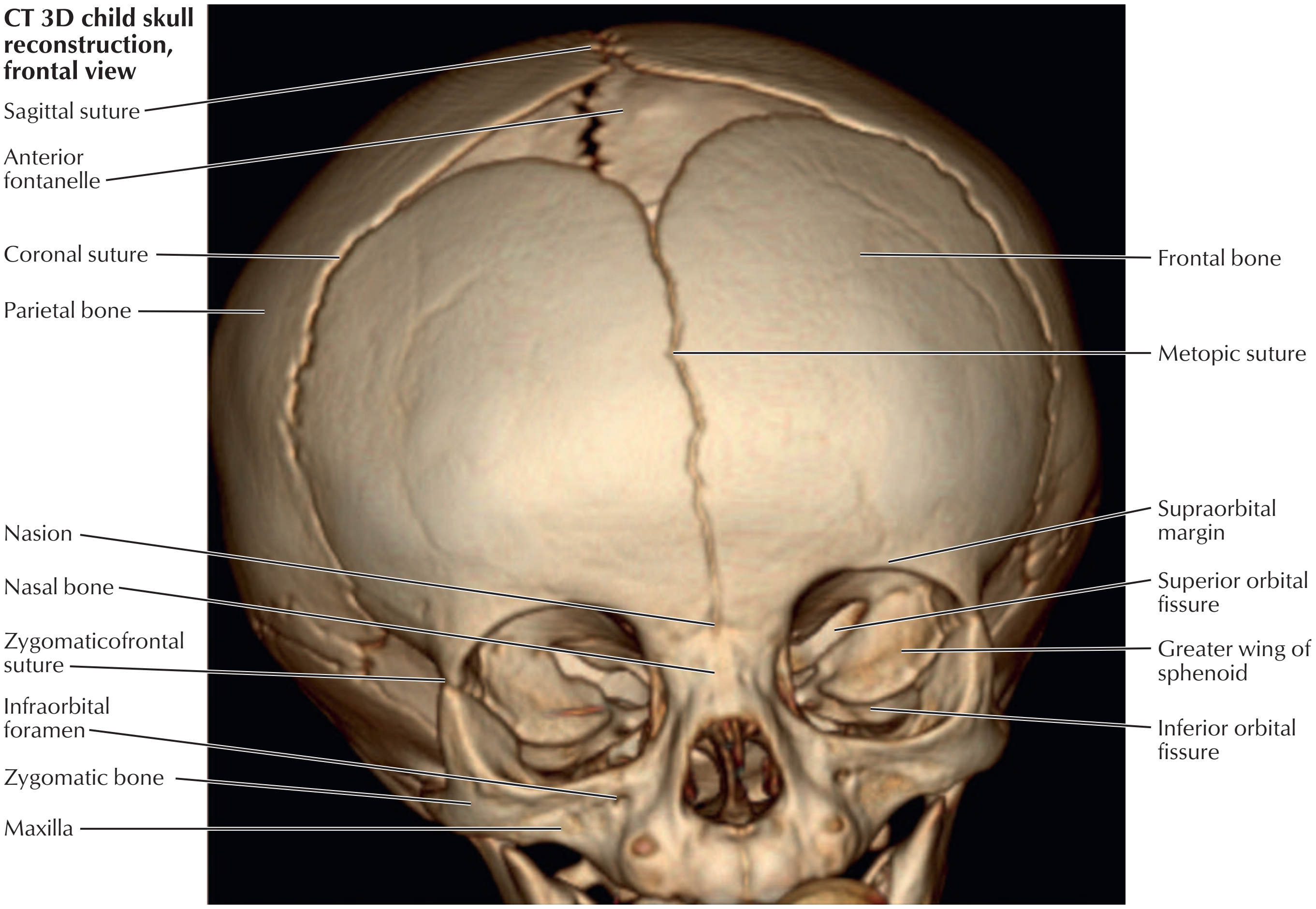
MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Sphincter pupillae	Intrinsic eye	Circular smooth muscle of iris that passes around pupil	Blends with dilator pupillae fibers	Parasympathetic fibers via oculomotor nerve (CN III)	Ophthalmic artery	Constricts pupil
Stapedius	Middle ear	Pyramidal eminence of temporal bone	Stapes	Facial nerve	Posterior auricular, anterior tympanic, and middle meningeal arteries	Pulls stapes posteriorly to lessen oscillation of tympanic membrane
Sternocleidomastoid	Neck	*Sternal head:* anterior surface of manubrium *Clavicular head:* upper surface of medial 1/3 of clavicle	Lateral surface of mastoid process; lateral half of superior nuchal line of occipital bone	Accessory nerve (CN XI)	Sternocleidomastoid branch of superior thyroid and occipital arteries, muscular branch of suprascapular artery, occipital branch of posterior auricular artery	*Bilaterally:* flexes head, raises thorax *Unilaterally:* turns face toward opposite side
Sternohyoid	Infrahyoid	Posterior surface of manubrium sterni, posterior sternoclavicular ligament, medial end of clavicle	Medial part of lower border of body of hyoid bone	Ansa cervicalis	Sternocleidomastoid and hyoid branches of superior thyroid artery, hyoid branch of lingual artery	Depresses larynx and hyoid bone, steadies hyoid bone
Sternothyroid	Infrahyoid	Posterior surface of manubrium sterni below and deep to origin of sternohyoid, edge of 1st costal cartilage	Oblique line on lamina of thyroid cartilage	Ansa cervicalis	Cricothyroid branch of superior thyroid artery	Depresses larynx and thyroid cartilage
Styloglossus	Extrinsic tongue	Styloid process and stylohyoid ligament	Lateral and inferior aspect of tongue	Hypoglossal nerve (CN XII)	Sublingual artery	Retracts tongue and draws it up for swallowing
Stylohyoid	Suprahyoid	Posterior border of styloid process	Body of hyoid bone at junction with greater horn	Facial nerve	Muscular branches of facial artery, muscular branches of occipital artery	Elevates and retracts hyoid bone
Stylopharyngeus	Longitudinal pharyngeal	Medial aspect of styloid process	Pharyngeal wall and posterior border of thyroid cartilage	Glossopharyngeal nerve (CN IX)	Ascending pharyngeal artery, ascending palatine and tonsillar branches of facial artery, dorsal branches of lingual artery	Elevates pharynx and larynx during swallowing and speaking
Subclavius	Shoulder	Upper border of 1st rib and its cartilage	Inferior surface of middle third of clavicle	Nerve to subclavius muscle	Clavicular branch of thoracoacromial artery	Anchors and depresses clavicle
Superior longitudinal lingual muscle	Intrinsic tongue	Submucous fibers at back of tongue	Apex of tongue; unites with muscle of opposite side	Hypoglossal nerve (CN XII)	Deep lingual branch of lingual artery, branches from facial artery	Shortens tongue, turns tip and sides upward
Superior oblique	Extraocular; eyelid	Body of sphenoid bone (above optic canal), medial to origin of superior rectus	Passes through trochlea, attaches to superior sclera between superior and lateral recti muscles	Trochlear nerve (CN IV)	Ophthalmic artery	Abducts, depresses, and medially rotates eyeball
Superior pharyngeal constrictor	Circular pharyngeal	Hamulus, pterygomandibular raphe, mylohyoid line of mandible	Median raphe of pharynx	Vagus nerve via pharyngeal plexus	Ascending pharyngeal artery, ascending palatine and tonsillar branches of facial artery, dorsal branches of lingual artery	Constricts wall of pharynx during swallowing
Superior rectus	Extraocular; eyelid	Common tendinous ring	Superior aspect of eyeball, posterior to the corneoscleral junction	Oculomotor nerve (CN III), superior division	Ophthalmic artery	Elevates, adducts, and medially rotates eyeball

MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Temporalis	Mastication	Floor of temporal fossa, deep temporal fascia	Coronoid process and ramus of mandible	Mandibular nerve (CN V_3), deep temporal nerves	Superficial temporal and maxillary arteries, middle, anterior, and posterior deep temporal arteries	Elevates mandible; posterior fibers retract mandible
Tensor tympani	Middle ear	Cartilage of pharyngotympanic (auditory, eustachian) tube	Handle of malleus	Mandibular branch of trigeminal nerve (CN V_3)	Superior tympanic branch of middle meningeal division of maxillary artery	Tenses tympanic membrane by drawing it medially
Tensor veli palatini	Palatal	Scaphoid fossa of medial pterygoid plate, spine of sphenoid bone, pharyngotympanic (auditory, eustachian) tube	Palatine aponeurosis	Mandibular nerve	Ascending palatine artery branch of facial artery, descending palatine artery branch of maxillary artery	Tenses soft palate, opens pharyngotympanic (auditory, eustachian) tube during swallowing and yawning
Thyroarytenoid	Laryngeal	Posterior aspect of thyroid cartilage	Muscular process of arytenoid cartilage	Recurrent laryngeal nerve	Superior and inferior thyroid arteries	Shortens and relaxes vocal cords, sphincter of vestibule
Thyrohyoid	Infrahyoid	Oblique line on lamina of thyroid cartilage	Lower border of body and greater horn of hyoid bone	Thyrohyoid branch of C1 nerve via hypoglossal nerve (CN XII)	Hyoid branch of superior thyroid artery	Depresses larynx and hyoid bone, elevates larynx when hyoid bone is fixed
Transverse and oblique arytenoid	Laryngeal	Arytenoid cartilage	Opposite arytenoid cartilage	Recurrent laryngeal nerve	Superior and inferior thyroid arteries	Closes intercartilaginous portion of rima glottides
Transverse (tongue)	Intrinsic tongue	Median fibrous septum of tongue	Dorsum and sides of tongue	Hypoglossal nerve (CN XII)	Deep lingual branch of lingual artery, branches from facial artery	Narrows and elongates tongue
Vertical (tongue)	Intrinsic tongue	Mucous membrane on dorsum of forepart of tongue	Fibers extend from dorsum to undersurface of tongue	Hypoglossal nerve (CN XII)	Deep lingual branch of lingual artery, branches from facial artery	Flattens and broadens tongue
Vocalis	Laryngeal	Vocal process of arytenoid cartilage	Vocal ligament	Recurrent laryngeal nerve	Superior and inferior thyroid arteries	Tenses anterior vocal ligament, relaxes posterior vocal ligament
Zygomaticus major	Facial expression	Zygomatic arch	Angle of mouth	Zygomatic and buccal branches of facial nerve	Superior labial artery of facial artery	Draws angle of mouth backward and upward
Zygomaticus minor	Facial expression	Zygomatic arch	Angle of mouth, upper lip	Zygomatic and buccal branches of facial nerve	Superior labial artery of facial artery	Elevates upper lip

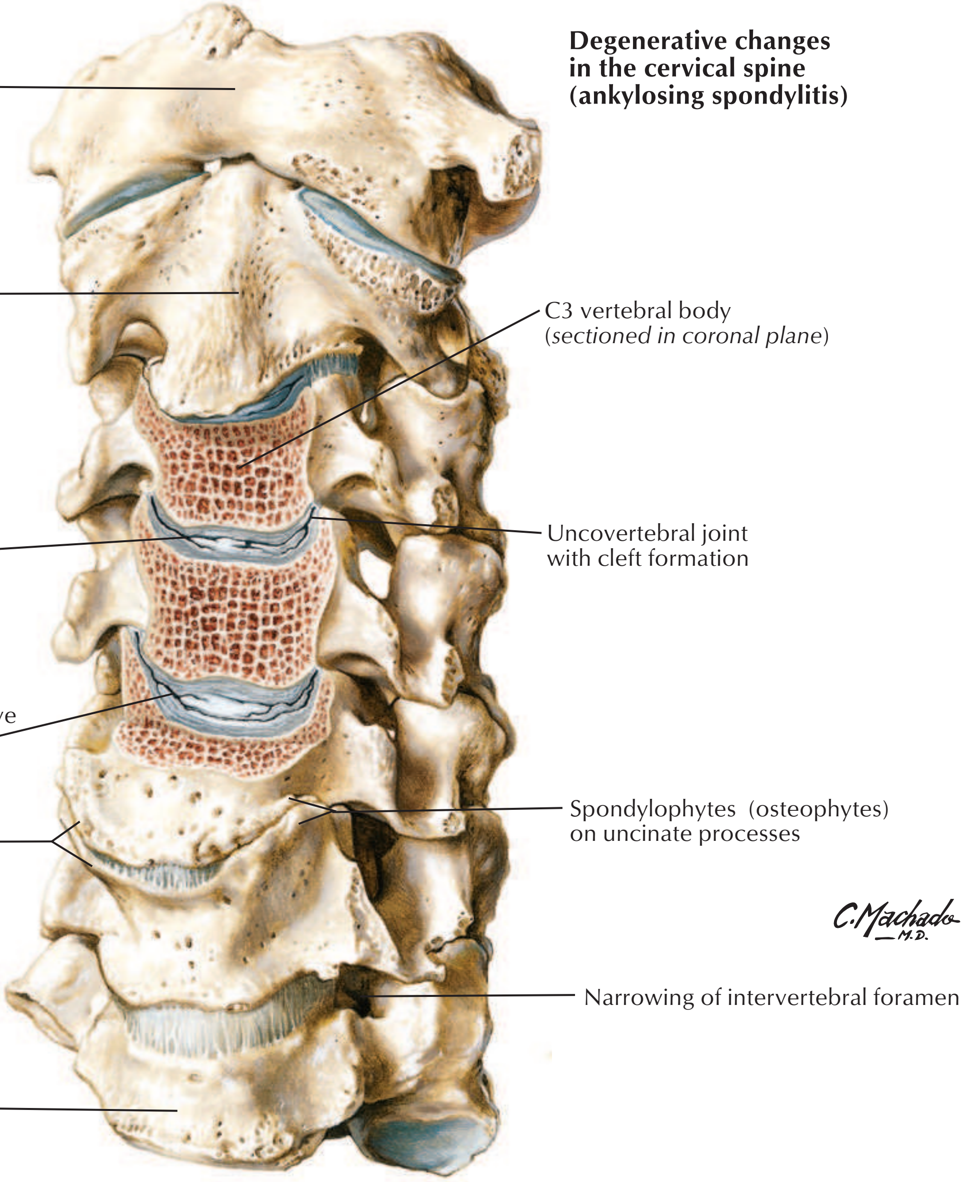
CT 3D child skull reconstruction, lateral view


Coronal suture
Frontal bone
Zygomatic arch
Zygomatic bone
Nasal bone
Condyle of mandible
Coronoid process of mandible
Anterior nasal spine
Parietal bone
Lambdoid suture
Squamosal suture
Occipital bone
Temporal bone
External acoustic meatus of the temporal bone
Posterior arch C1
Anterior arch C1

CT 3D child skull reconstruction, frontal view


Sagittal suture
Anterior fontanelle
Coronal suture
Parietal bone
Nasion
Nasal bone
Zygomaticofrontal suture
Infraorbital foramen
Zygomatic bone
Maxilla
Frontal bone
Metopic suture
Supraorbital margin
Superior orbital fissure
Greater wing of sphenoid
Inferior orbital fissure

Degenerative Changes in Cervical Vertebrae


Degenerative changes in the cervical spine (ankylosing spondylitis)
Atlas (C1)
Axis (C2)
C3 vertebral body (*sectioned in coronal plane*)
Complete transverse cleft in intervertebral disc
Uncovertebral joint with cleft formation
Spread of cleft formation into central portion of intervertebral disc with age, leading to progressive degenerative changes in the disc
Deformed vertebral bodies and lipping of vertebral margins
Spondylophytes (osteophytes) on uncinate processes
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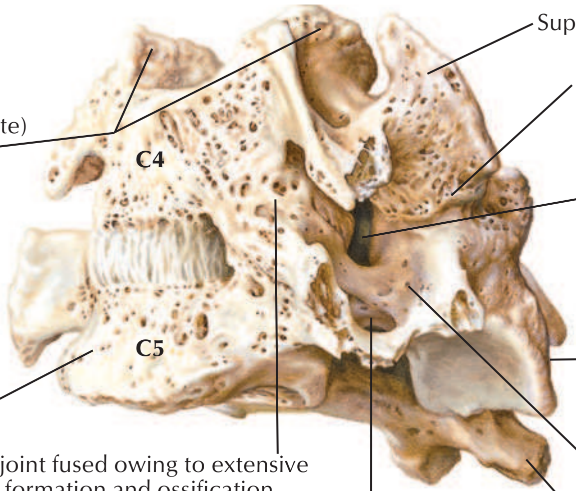
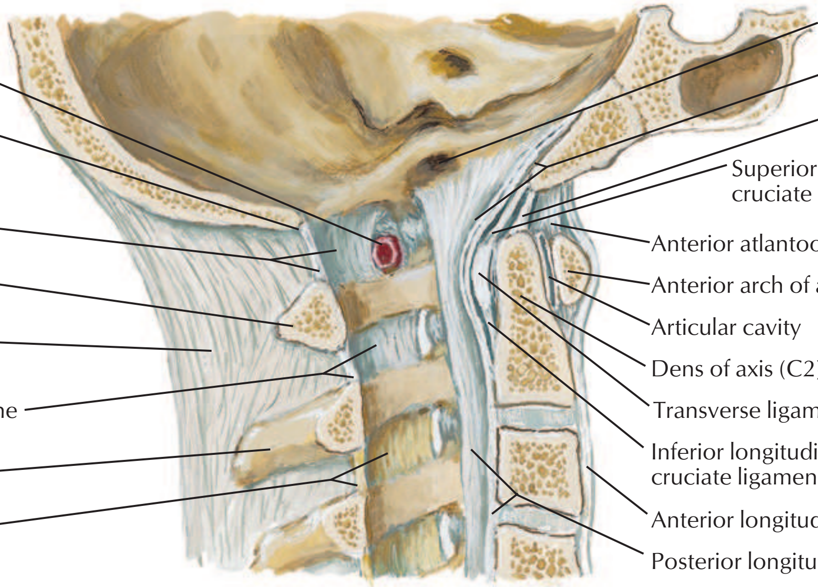
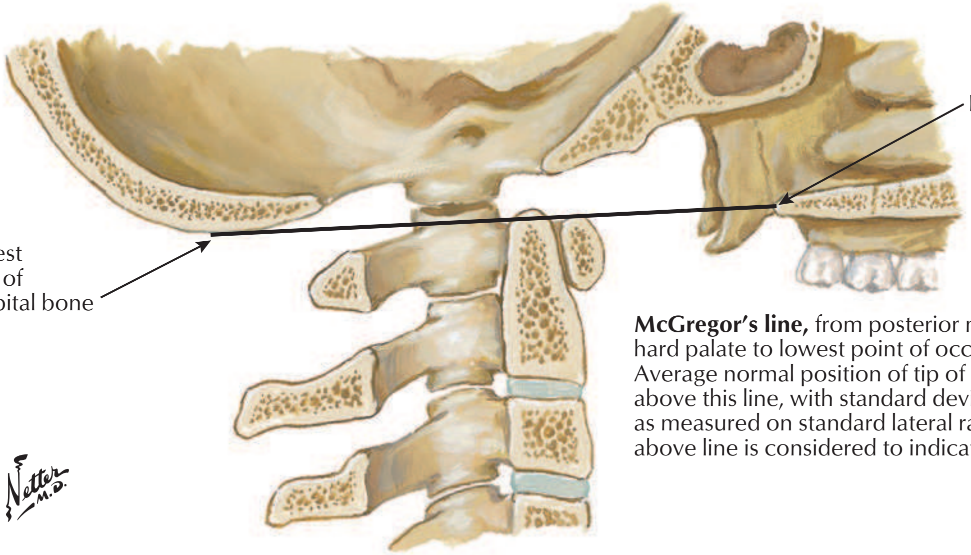
Narrowing of intervertebral foramen
C7 vertebra

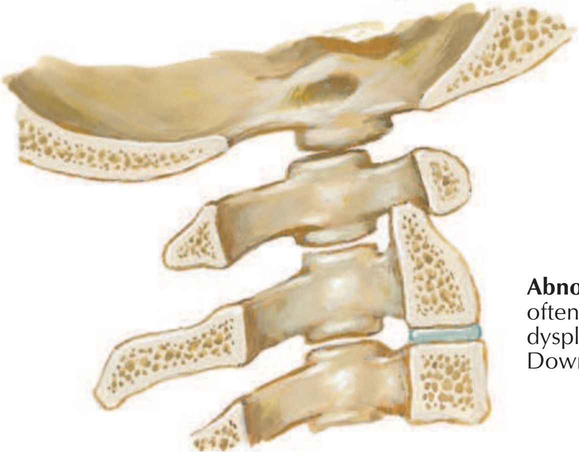
Advanced ankylosing spondylitis with uncovertebral arthrosis in C4 and C5


Advanced spondylophyte (osteophyte) formation on uncinate processes
C4
C5
Superior articular process
Facet joint ossified owing to advanced osteoarthritic change
Markedly narrowed intervertebral foramen may lead to compression of spinal nerve
Inferior articular process with facet
Vertebral body
Groove for spinal nerve on transverse process
Uncovertebral joint fused owing to extensive spondylophyte formation and ossification
Spinous process
Potential for compression of vertebral artery within transverse foramen


Vertebral artery
Posterior margin of foramen magnum
Posterior atlanto-occipital membrane
Posterior arch of atlas (C1)
Nuchal ligament
Posterior atlantoaxial membrane
Spinous process of axis (C2)
Ligamentum flavum
Hypoglossal canal
Tectorial membrane
Apical ligament of dens
Superior longitudinal band of cruciate ligament of atlas
Anterior atlantooccipital membrane
Anterior arch of atlas (C1)
Articular cavity
Dens of axis (C2)
Transverse ligament of atlas
Inferior longitudinal band of cruciate ligament of atlas
Anterior longitudinal ligament
Posterior longitudinal ligament

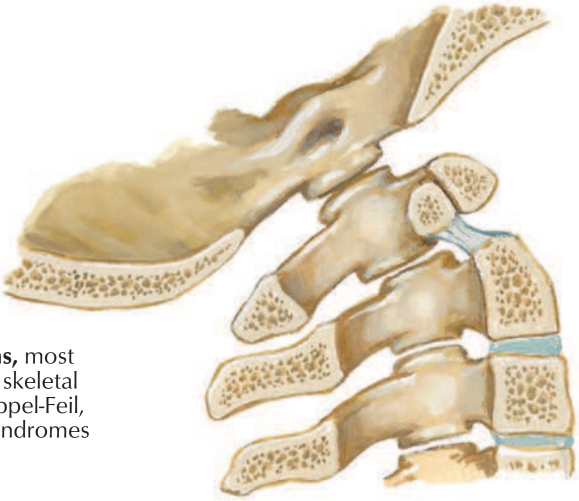

Posterior nasal spine
Lowest level of occipital bone

McGregor's line, from posterior nasal spine of hard palate to lowest point of occipital bone. Average normal position of tip of dens is 1.32 mm above this line, with standard deviation of ±2.6 mm as measured on standard lateral radiograph. Tip >4.5 mm above line is considered to indicate basilar impression.



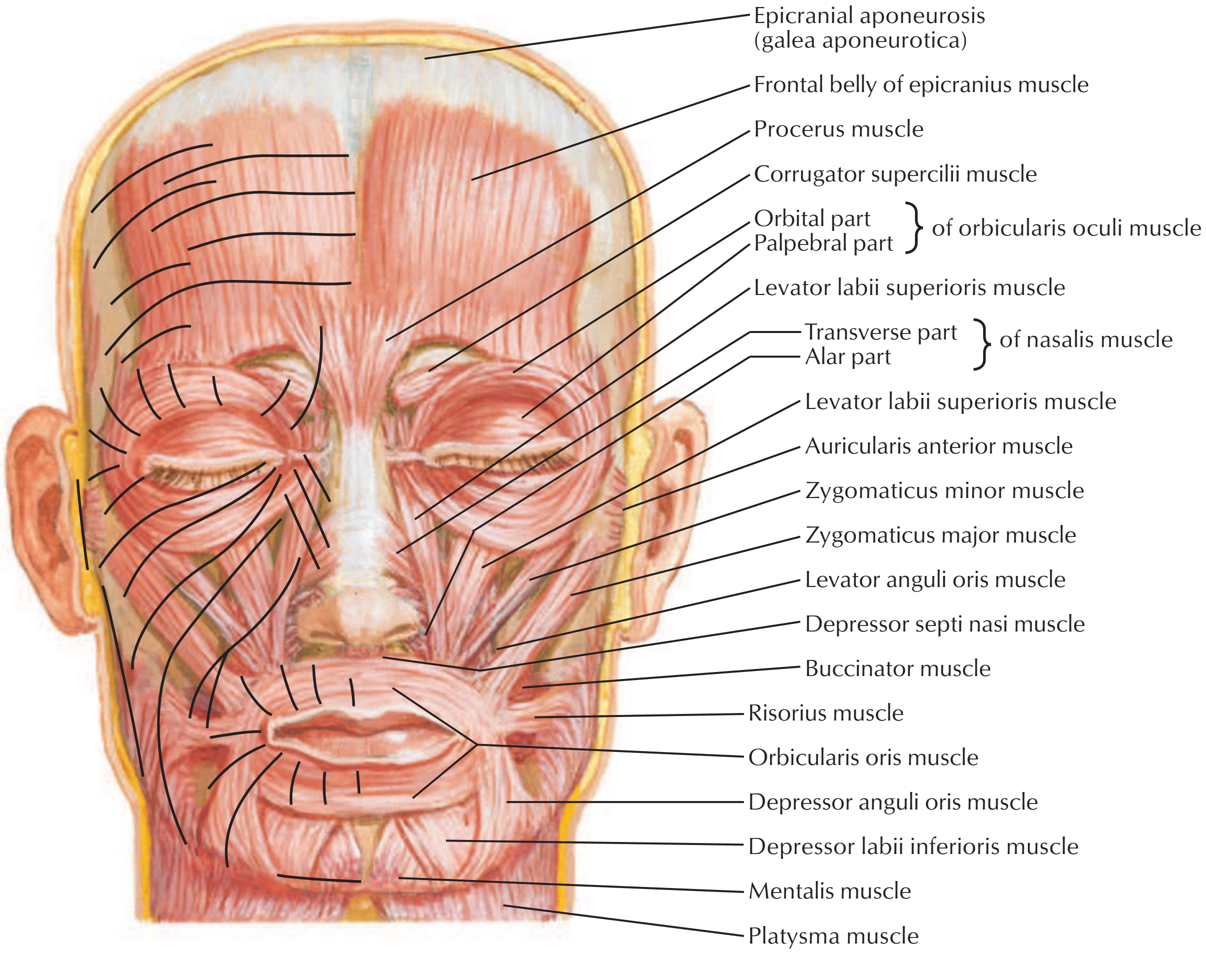
Hypoplastic dens

Abnormalities of dens, most often associated with skeletal dysplasias such as Klippel-Feil, Down, or Morquio syndromes



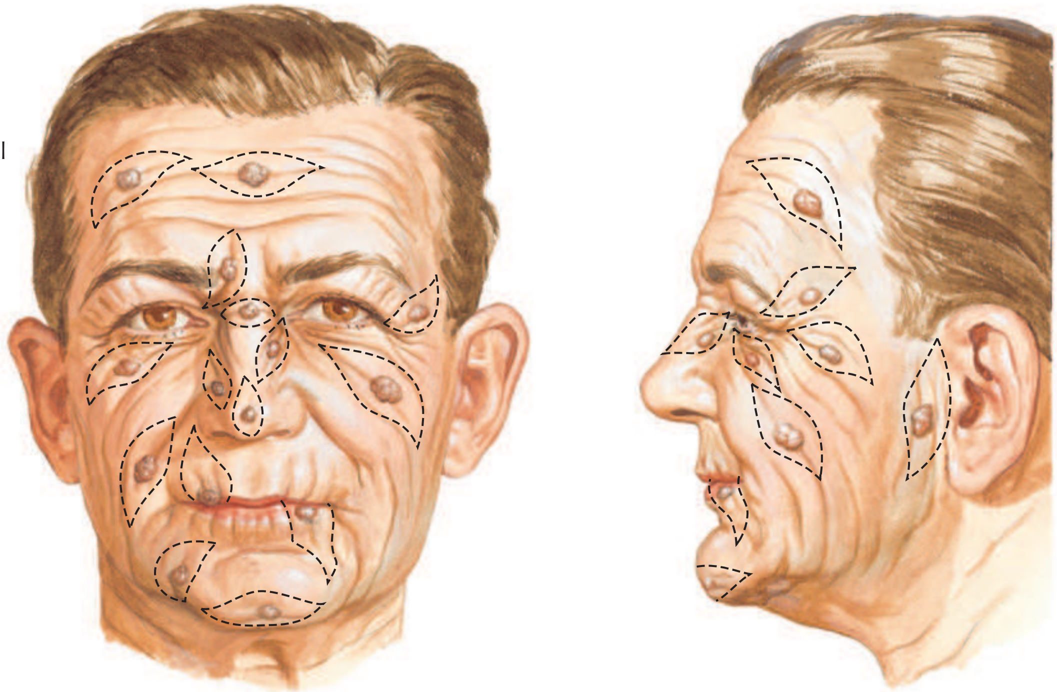
Os odontoideum with fibrous union and narrowing of vertebral canal with head in extension

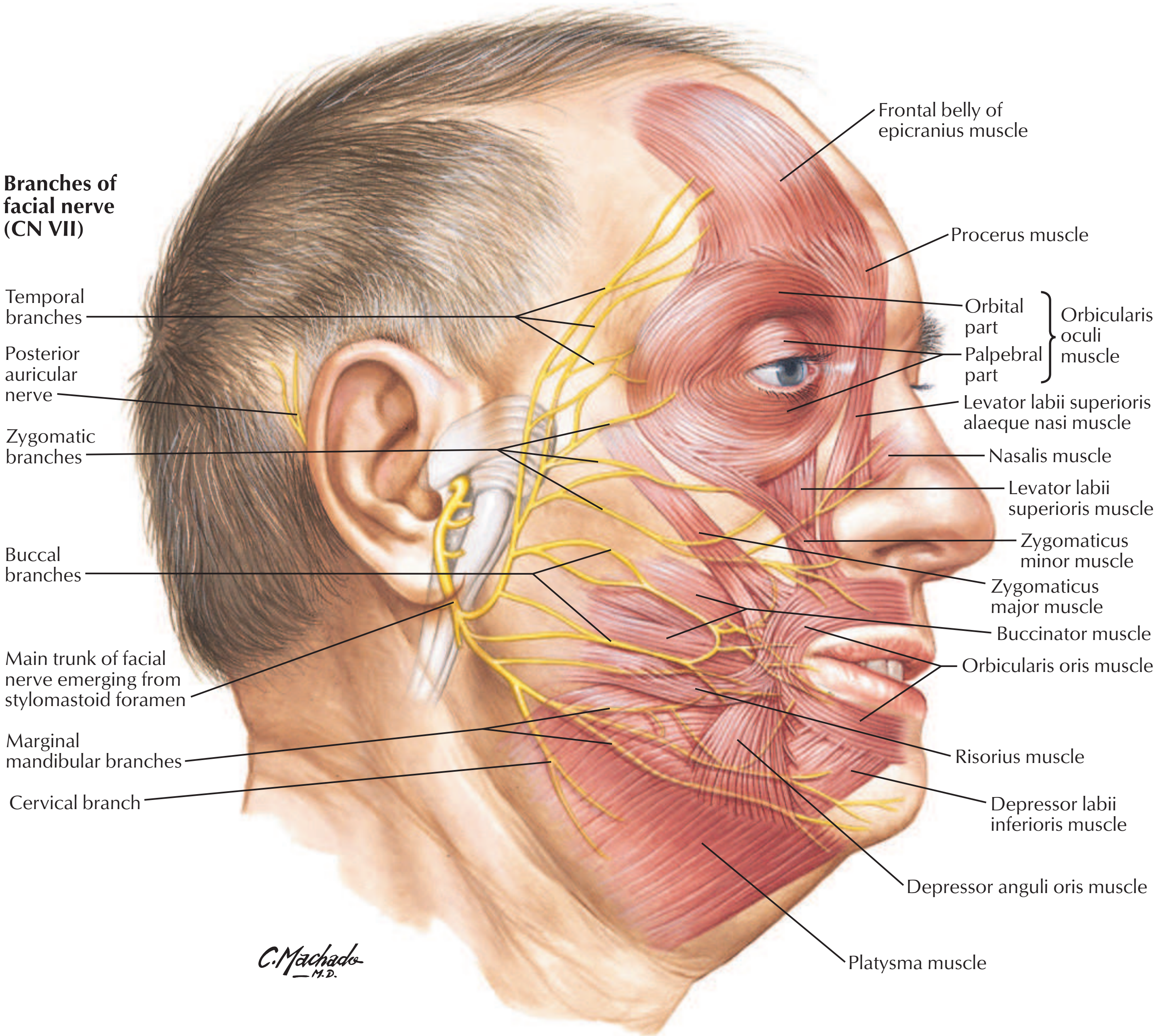
Muscles of Facial Expression: Anterior View



Epicranial aponeurosis (galea aponeurotica)
Frontal belly of epicranius muscle
Procerus muscle
Corrugator supercilii muscle
Orbital part
Palpebral part
of orbicularis oculi muscle
Levator labii superioris muscle
Transverse part
Alar part
of nasalis muscle
Levator labii superioris muscle
Auricularis anterior muscle
Zygomaticus minor muscle
Zygomaticus major muscle
Levator anguli oris muscle
Depressor septi nasi muscle
Buccinator muscle
Risorius muscle
Orbicularis oris muscle
Depressor anguli oris muscle
Depressor labii inferioris muscle
Mentalis muscle
Platysma muscle

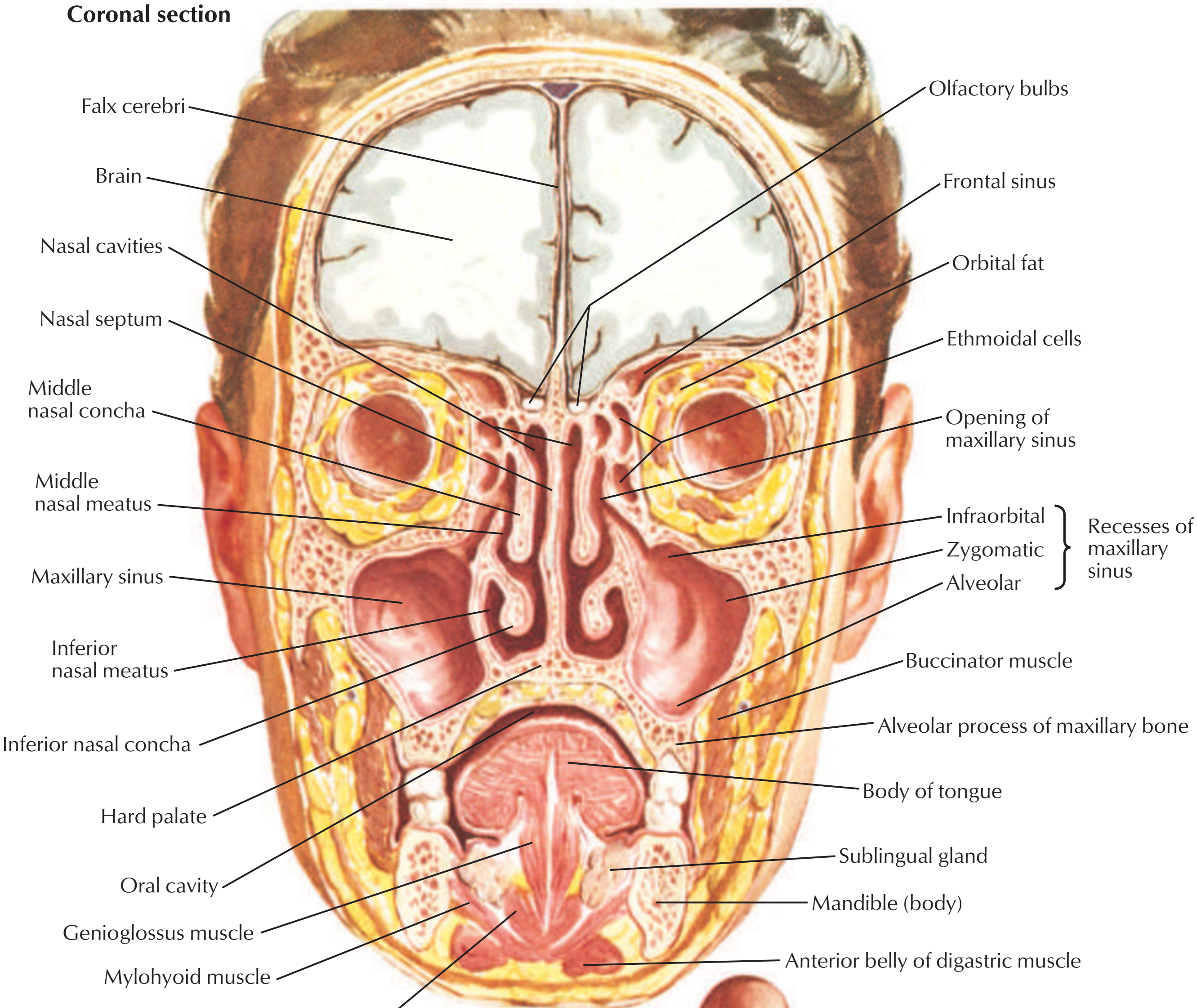
Course of wrinkle lines (Langer's lines) of skin is transverse to fiber direction of facial muscles. Elliptical incisions for removal of skin tumors conform to direction of wrinkle lines.

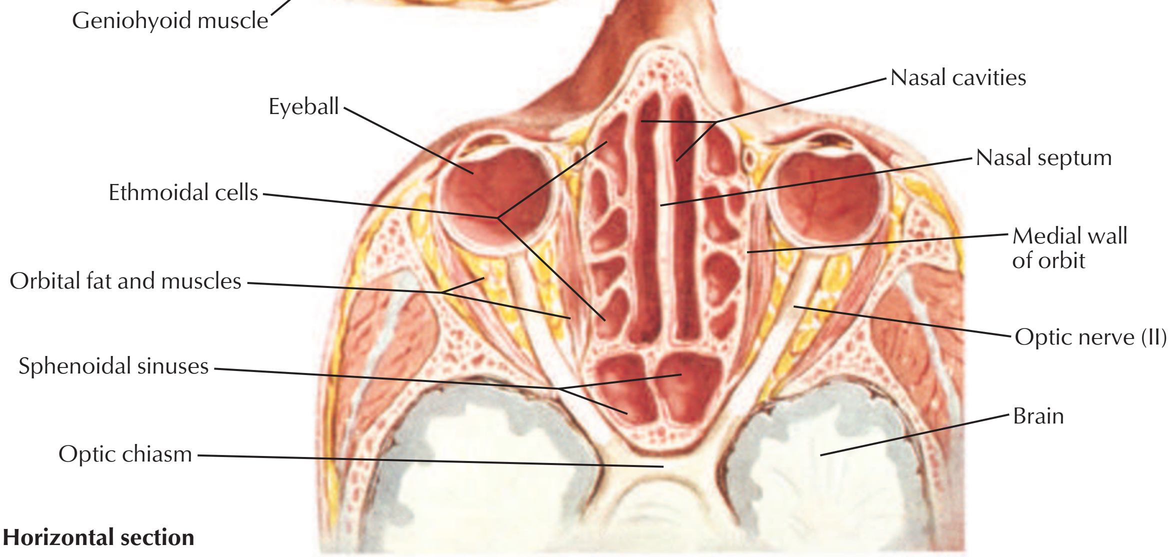



Frontal belly of epicranius muscle
Branches of facial nerve (CN VII)
Procerus muscle
Orbital part
Palpebral part
Orbicularis oculi muscle
Temporal branches
Posterior auricular nerve
Levator labii superioris alaeque nasi muscle
Zygomatic branches
Nasalis muscle
Levator labii superioris muscle
Zygomaticus minor muscle
Buccal branches
Zygomaticus major muscle
Buccinator muscle
Main trunk of facial nerve emerging from stylomastoid foramen
Orbicularis oris muscle
Marginal mandibular branches
Risorius muscle
Cervical branch
Depressor labii inferioris muscle
Depressor anguli oris muscle
C.Machado M.D.
Platysma muscle

Paranasal Sinuses

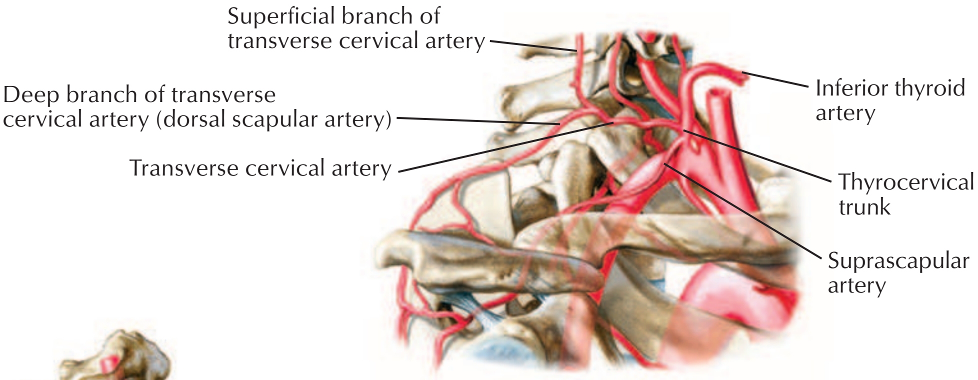
Coronal section


Falx cerebri
Brain
Nasal cavities
Nasal septum
Middle nasal concha
Middle nasal meatus
Maxillary sinus
Inferior nasal meatus
Inferior nasal concha
Hard palate
Oral cavity
Genioglossus muscle
Mylohyoid muscle
Geniohyoid muscle
Olfactory bulbs
Frontal sinus
Orbital fat
Ethmoidal cells
Opening of maxillary sinus
Infraorbital
Zygomatic
Alveolar
Recesses of maxillary sinus
Buccinator muscle
Alveolar process of maxillary bone
Body of tongue
Sublingual gland
Mandible (body)
Anterior belly of digastric muscle

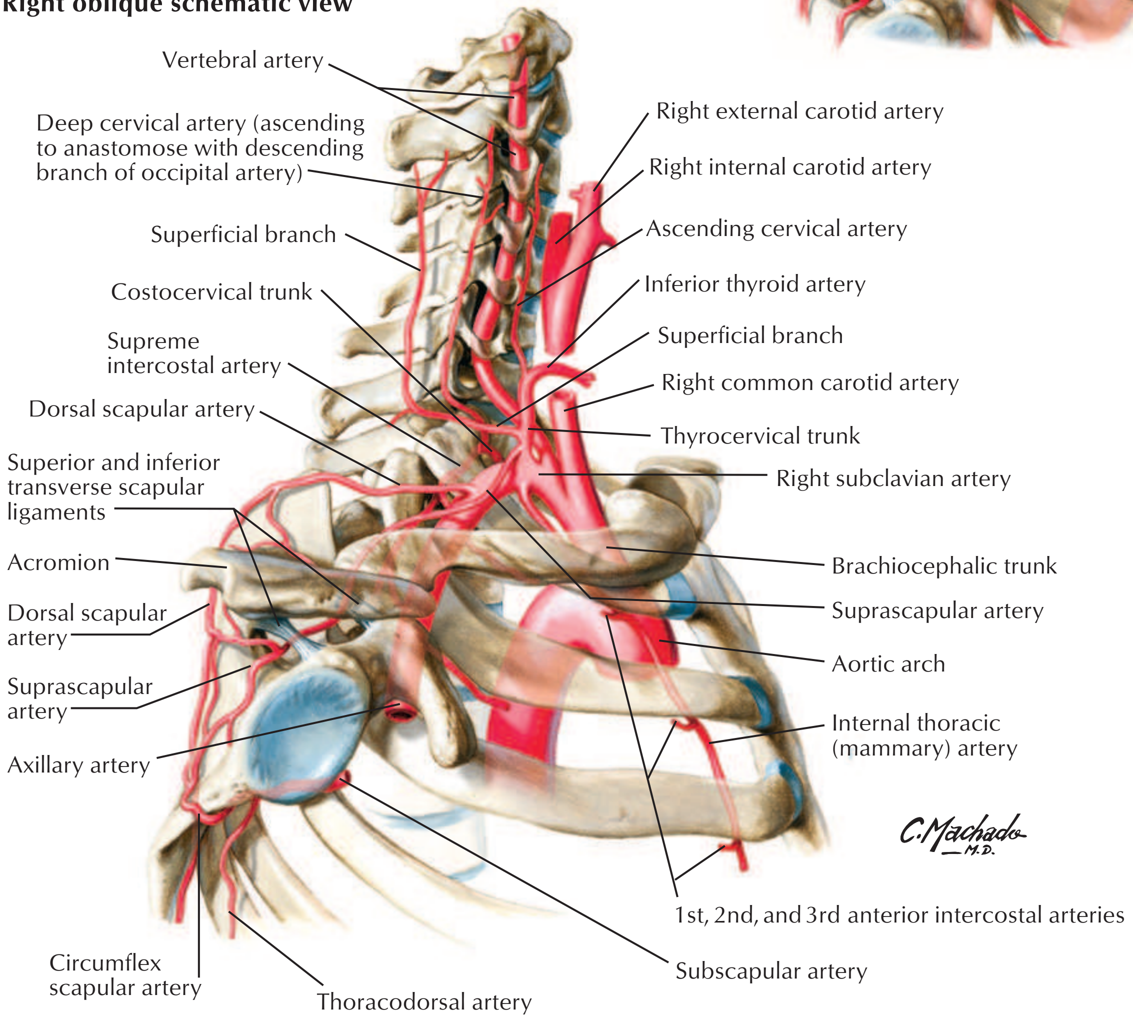

Eyeball
Ethmoidal cells
Orbital fat and muscles
Sphenoidal sinuses
Optic chiasm
Nasal cavities
Nasal septum
Medial wall of orbit
Optic nerve (II)
Brain

Horizontal section

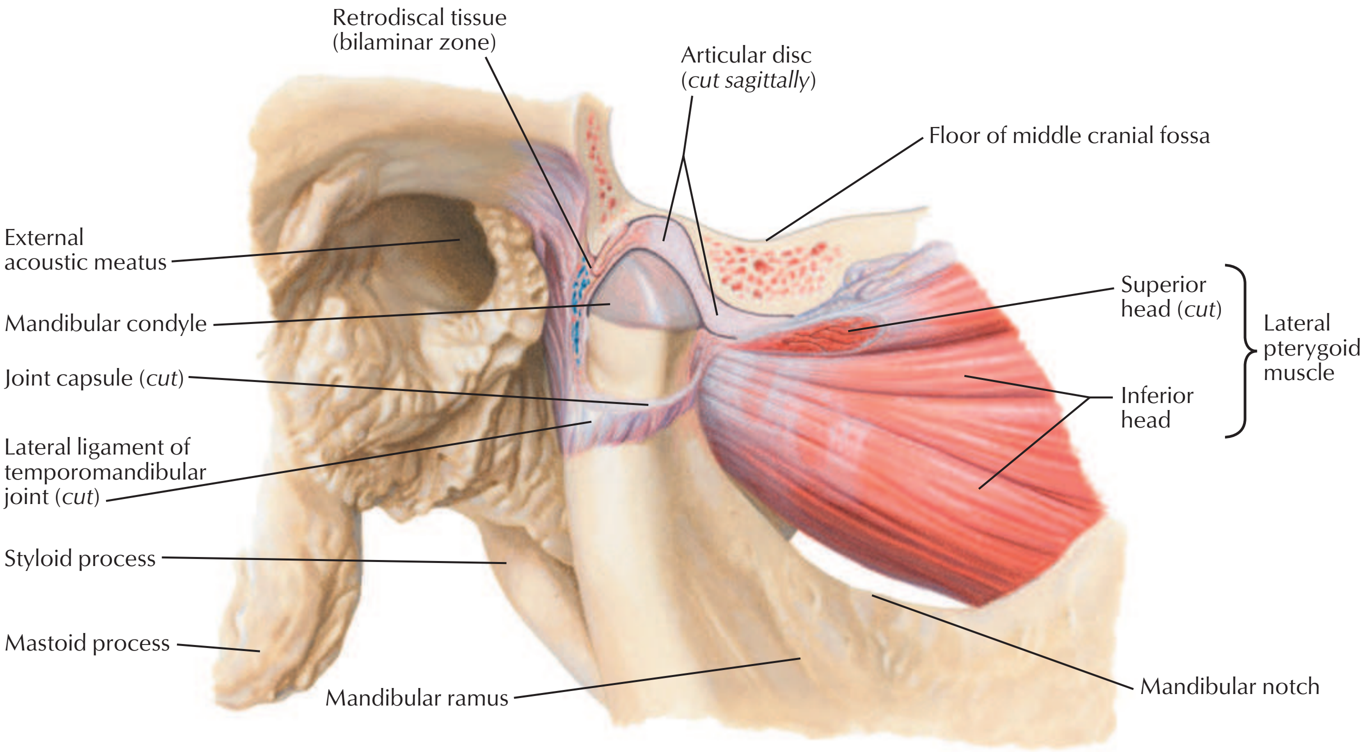
Common origin of superficial cervical and dorsal scapular arteries from transverse cervical artery (~30%)

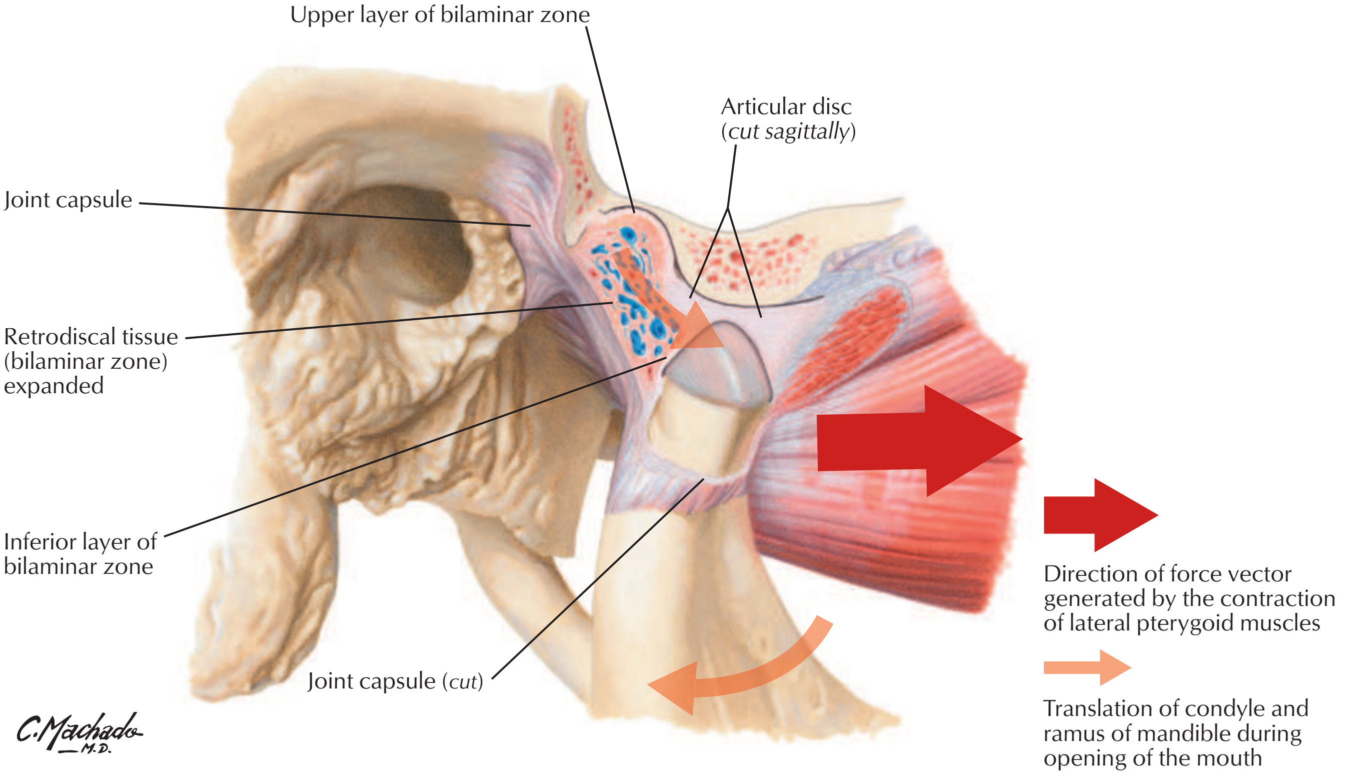

Superficial branch of transverse cervical artery
Deep branch of transverse cervical artery (dorsal scapular artery)
Transverse cervical artery
Inferior thyroid artery
Thyrocervical trunk
Suprascapular artery

Right oblique schematic view

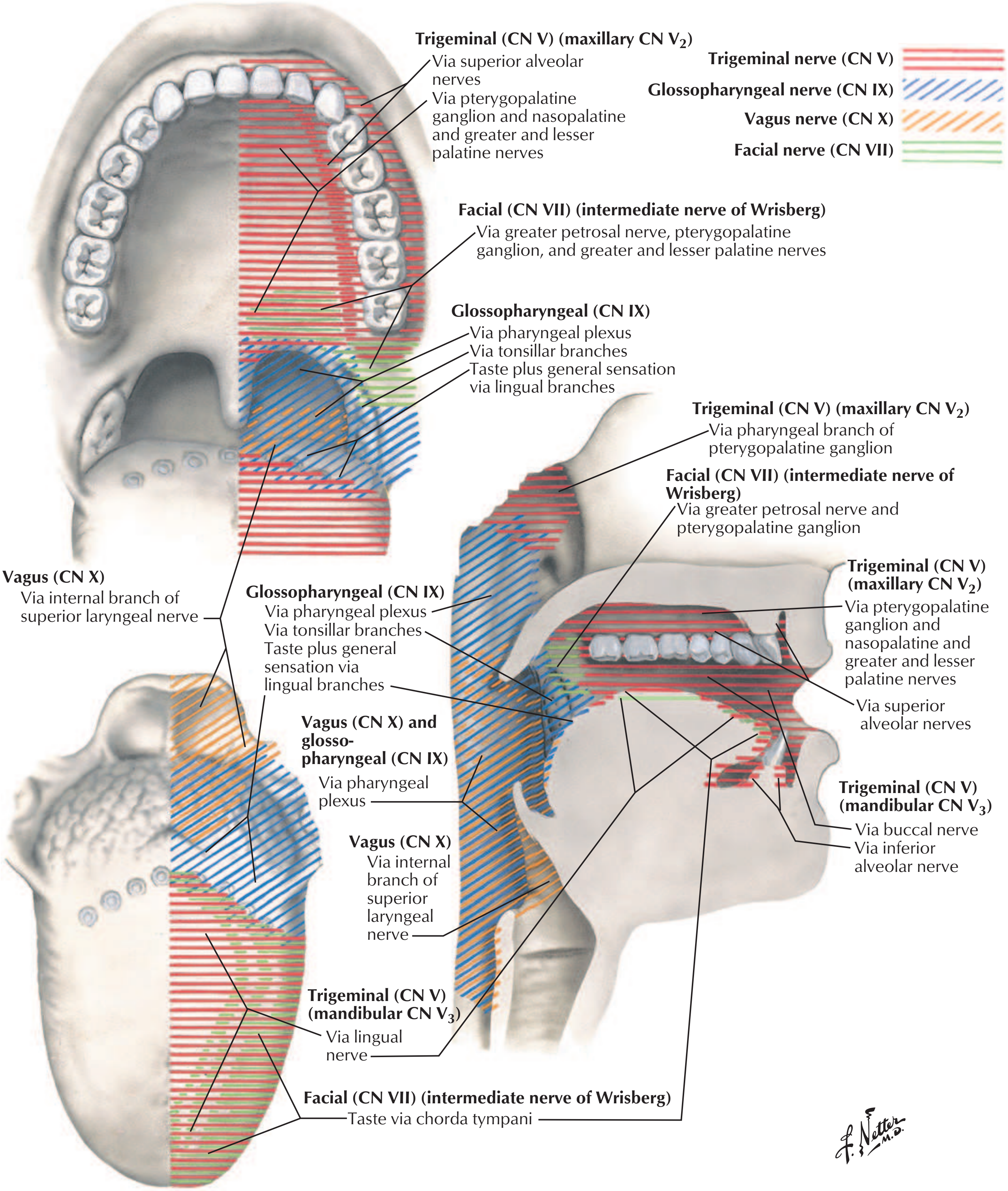

Vertebral artery
Deep cervical artery (ascending to anastomose with descending branch of occipital artery)
Superficial branch
Costocervical trunk
Supreme intercostal artery
Dorsal scapular artery
Superior and inferior transverse scapular ligaments
Acromion
Dorsal scapular artery
Suprascapular artery
Axillary artery
Circumflex scapular artery
Thoracodorsal artery
Subscapular artery
1st, 2nd, and 3rd anterior intercostal arteries
Right external carotid artery
Right internal carotid artery
Ascending cervical artery
Inferior thyroid artery
Superficial branch
Right common carotid artery
Thyrocervical trunk
Right subclavian artery
Brachiocephalic trunk
Suprascapular artery
Aortic arch
Internal thoracic (mammary) artery
C.Machado M.D.

Opening of the Mandible


Retrodiscal tissue (bilaminar zone)
Articular disc (*cut sagittally*)
Floor of middle cranial fossa
External acoustic meatus
Mandibular condyle
Joint capsule (*cut*)
Lateral ligament of temporomandibular joint (*cut*)
Styloid process
Mastoid process
Mandibular ramus
Superior head (*cut*)
Inferior head
Lateral pterygoid muscle
Mandibular notch

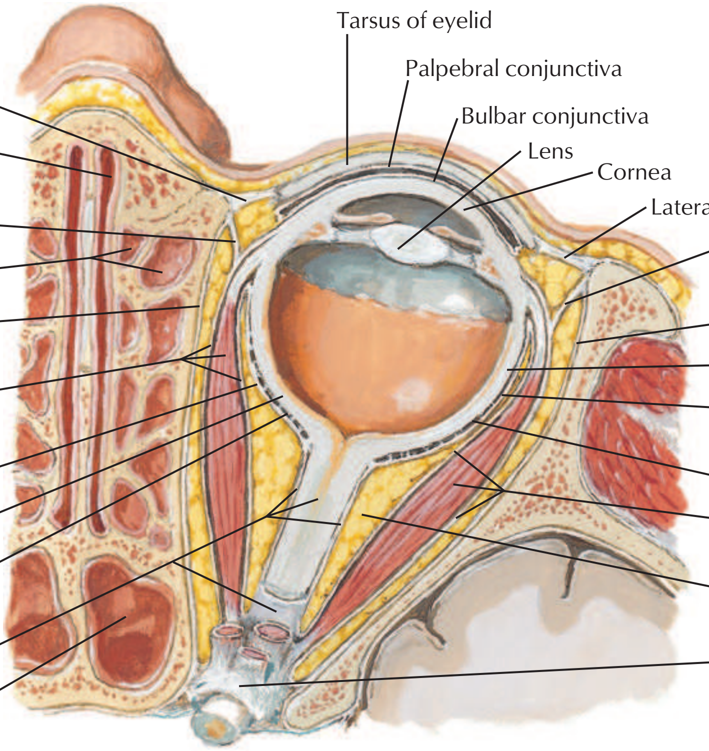

Upper layer of bilaminar zone
Articular disc (*cut sagittally*)
Joint capsule
Retrodiscal tissue (bilaminar zone) expanded
Inferior layer of bilaminar zone
Joint capsule (*cut*)
Direction of force vector generated by the contraction of lateral pterygoid muscles
Translation of condyle and ramus of mandible during opening of the mouth

Afferent Innervation of Oral Cavity and Pharynx


Trigeminal nerve (CN V) 🟥
Glossopharyngeal nerve (CN IX) 🟦
Vagus nerve (CN X) 🟧
Facial nerve (CN VII) 🟩
Trigeminal (CN V) (maxillary CN V_2)
Via superior alveolar nerves
Via pterygopalatine ganglion and nasopalatine and greater and lesser palatine nerves
Facial (CN VII) (intermediate nerve of Wrisberg)
Via greater petrosal nerve, pterygopalatine ganglion, and greater and lesser palatine nerves
Glossopharyngeal (CN IX)
Via pharyngeal plexus
Via tonsillar branches
Taste plus general sensation via lingual branches
Trigeminal (CN V) (maxillary CN V_2)
Via pharyngeal branch of pterygopalatine ganglion
Facial (CN VII) (intermediate nerve of Wrisberg)
Via greater petrosal nerve and pterygopalatine ganglion
Trigeminal (CN V) (maxillary CN V_2)
Via pterygopalatine ganglion and nasopalatine and greater and lesser palatine nerves
Via superior alveolar nerves
Trigeminal (CN V) (mandibular CN V_3)
Via buccal nerve
Via inferior alveolar nerve
Vagus (CN X)
Via internal branch of superior laryngeal nerve
Glossopharyngeal (CN IX)
Via pharyngeal plexus
Via tonsillar branches
Taste plus general sensation via lingual branches
Vagus (CN X) and glosso-pharyngeal (CN IX)
Via pharyngeal plexus
Vagus (CN X)
Via internal branch of superior laryngeal nerve
Trigeminal (CN V) (mandibular CN V_3)
Via lingual nerve
Facial (CN VII) (intermediate nerve of Wrisberg)
Taste via chorda tympani
F. Netter M.D.

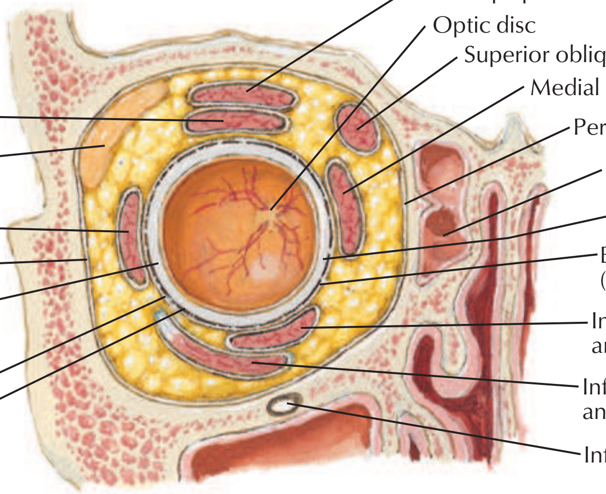
Fasciae of Orbit and Eyeball

Horizontal section



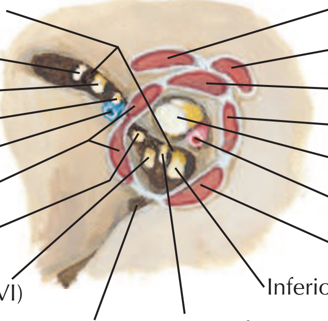
Medial palpebral ligament
Nasal cavity
Check ligament of medial rectus muscle
Ethmoidal cells
Periorbita
Medial rectus muscle and fascial sheath
Bulbar sheath (Tenon's capsule)
Sclera
Episcleral space
Optic nerve (CN II) and meningeal sheath
Sphenoidal sinus
Tarsus of eyelid
Palpebral conjunctiva
Bulbar conjunctiva
Lens
Cornea
Lateral palpebral ligament
Check ligament of lateral rectus muscle
Periorbita
Sclera
Bulbar sheath (Tenon's capsule)
Episcleral space
Lateral rectus muscle and fascial sheath
Retrobulbar fat (orbital fat body)
Common tendinous ring (of Zinn)

Frontal section



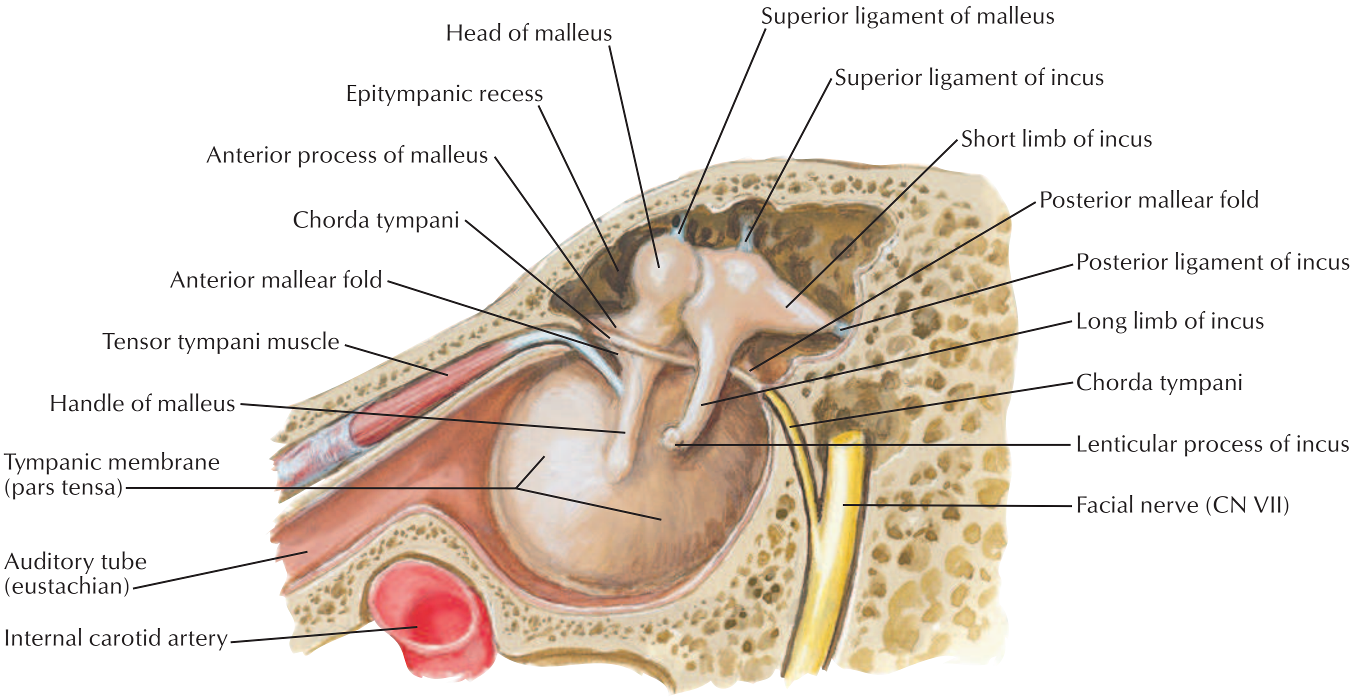
Superior rectus muscle and fascial sheath
Lacrimal gland
Lateral rectus muscle and fascial sheath
Periorbita
Sclera
Bulbar sheath (Tenon's capsule)
Episcleral space
Levator palpebrae superioris muscle and fascial sheath
Optic disc
Superior oblique muscle and fascial sheath
Medial rectus muscle and fascial sheath
Periorbita
Ethmoidal cell
Sclera
Bulbar sheath (Tenon's capsule)
Inferior rectus muscle and fascial sheath
Inferior oblique muscle and fascial sheath
Infraorbital nerve (CN V_2)

Muscle attachments and nerves and vessels entering orbit

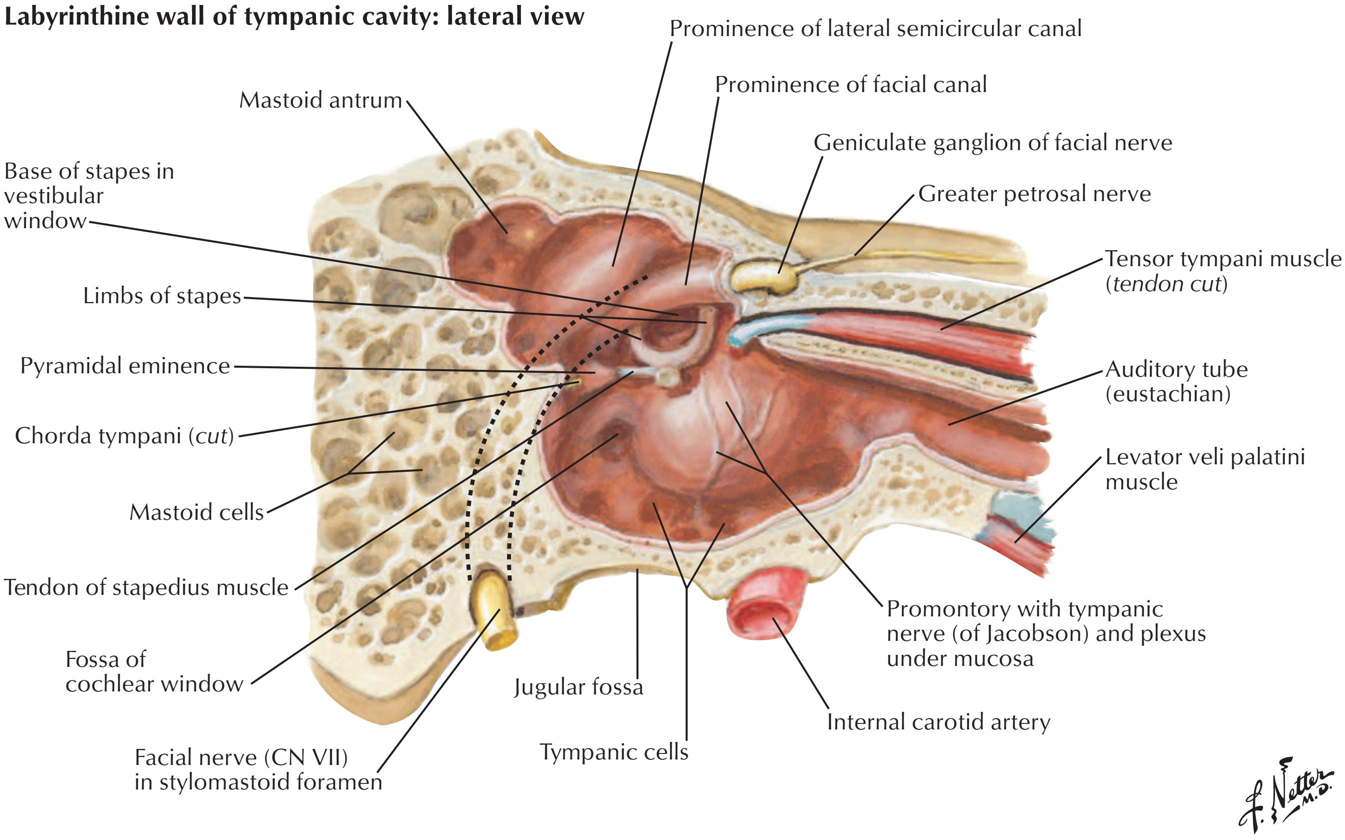


Superior orbital fissure
Lacrimal nerve (CN V_1)
Frontal nerve (CN V_1)
Trochlear nerve (CN IV)
Superior ophthalmic vein
Lateral rectus muscle
Superior branch of oculomotor nerve (CN III)
Abducent nerve (CN VI)
Inferior orbital fissure
Nasociliary nerve (CN V_1)
Levator palpebrae superioris muscle
Superior oblique muscle
Superior rectus muscle
Medial rectus muscle
Optic nerve (CN II)
Ophthalmic artery
in optic canal
Inferior rectus muscle
Inferior branch of oculomotor nerve (CN III)

Lateral wall of tympanic cavity: medial (internal) view


Head of malleus
Superior ligament of malleus
Epitympanic recess
Superior ligament of incus
Anterior process of malleus
Short limb of incus
Chorda tympani
Posterior mallear fold
Anterior mallear fold
Posterior ligament of incus
Tensor tympani muscle
Long limb of incus
Handle of malleus
Chorda tympani
Lenticular process of incus
Tympanic membrane (pars tensa)
Facial nerve (CN VII)
Auditory tube (eustachian)
Internal carotid artery

Labyrinthine wall of tympanic cavity: lateral view


Prominence of lateral semicircular canal
Prominence of facial canal
Mastoid antrum
Geniculate ganglion of facial nerve
Base of stapes in vestibular window
Greater petrosal nerve
Tensor tympani muscle (*tendon cut*)
Limbs of stapes
Pyramidal eminence
Auditory tube (eustachian)
Chorda tympani (*cut*)
Levator veli palatini muscle
Mastoid cells
Tendon of stapedius muscle
Promontory with tympanic nerve (of Jacobson) and plexus under mucosa
Fossa of cochlear window
Jugular fossa
Internal carotid artery
Tympanic cells
Facial nerve (CN VII) in stylomastoid foramen

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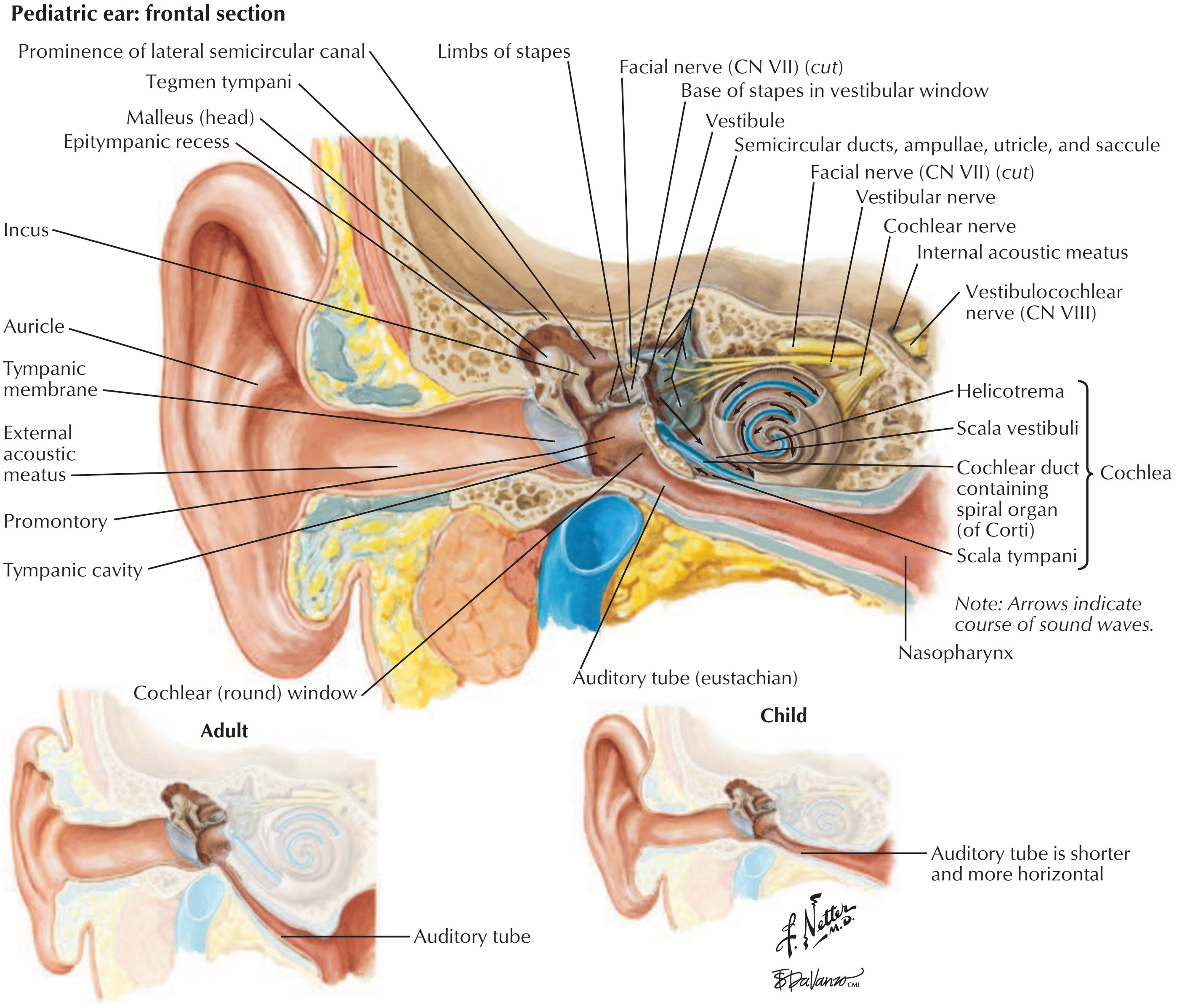
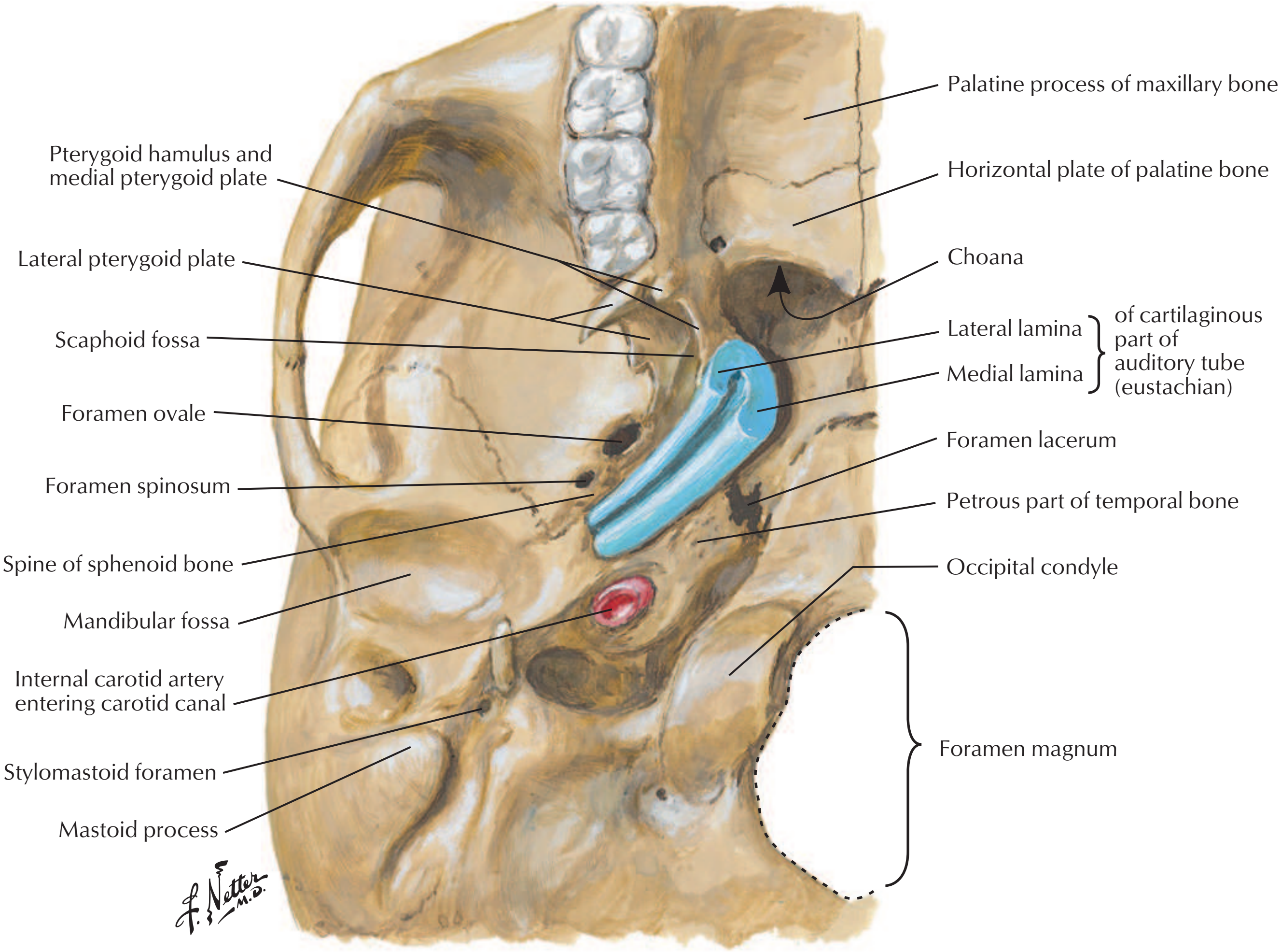
Anatomy of the Pediatric Ear


Pediatric ear: frontal section
Prominence of lateral semicircular canal
Tegmen tympani
Malleus (head)
Epitympanic recess
Incus
Auricle
Tympanic membrane
External acoustic meatus
Promontory
Tympanic cavity
Cochlear (round) window
Limbs of stapes
Facial nerve (CN VII) (cut)
Base of stapes in vestibular window
Vestibule
Semicircular ducts, ampullae, utricle, and saccule
Facial nerve (CN VII) (cut)
Vestibular nerve
Cochlear nerve
Internal acoustic meatus
Vestibulocochlear nerve (CN VIII)
Helicotrema
Scala vestibuli
Cochlear duct containing spiral organ (of Corti)
Scala tympani
Cochlea
Note: Arrows indicate course of sound waves.
Nasopharynx
Auditory tube (eustachian)
Adult
Auditory tube
Child
Auditory tube is shorter and more horizontal

Cartilaginous part of auditory tube (eustachian) at base of skull: inferior view


Palatine process of maxillary bone
Pterygoid hamulus and medial pterygoid plate
Horizontal plate of palatine bone
Lateral pterygoid plate
Choana
Scaphoid fossa
Lateral lamina
Medial lamina
of cartilaginous part of auditory tube (eustachian)
Foramen ovale
Foramen lacerum
Foramen spinosum
Petrous part of temporal bone
Spine of sphenoid bone
Occipital condyle
Mandibular fossa
Internal carotid artery entering carotid canal
Foramen magnum
Stylomastoid foramen
Mastoid process
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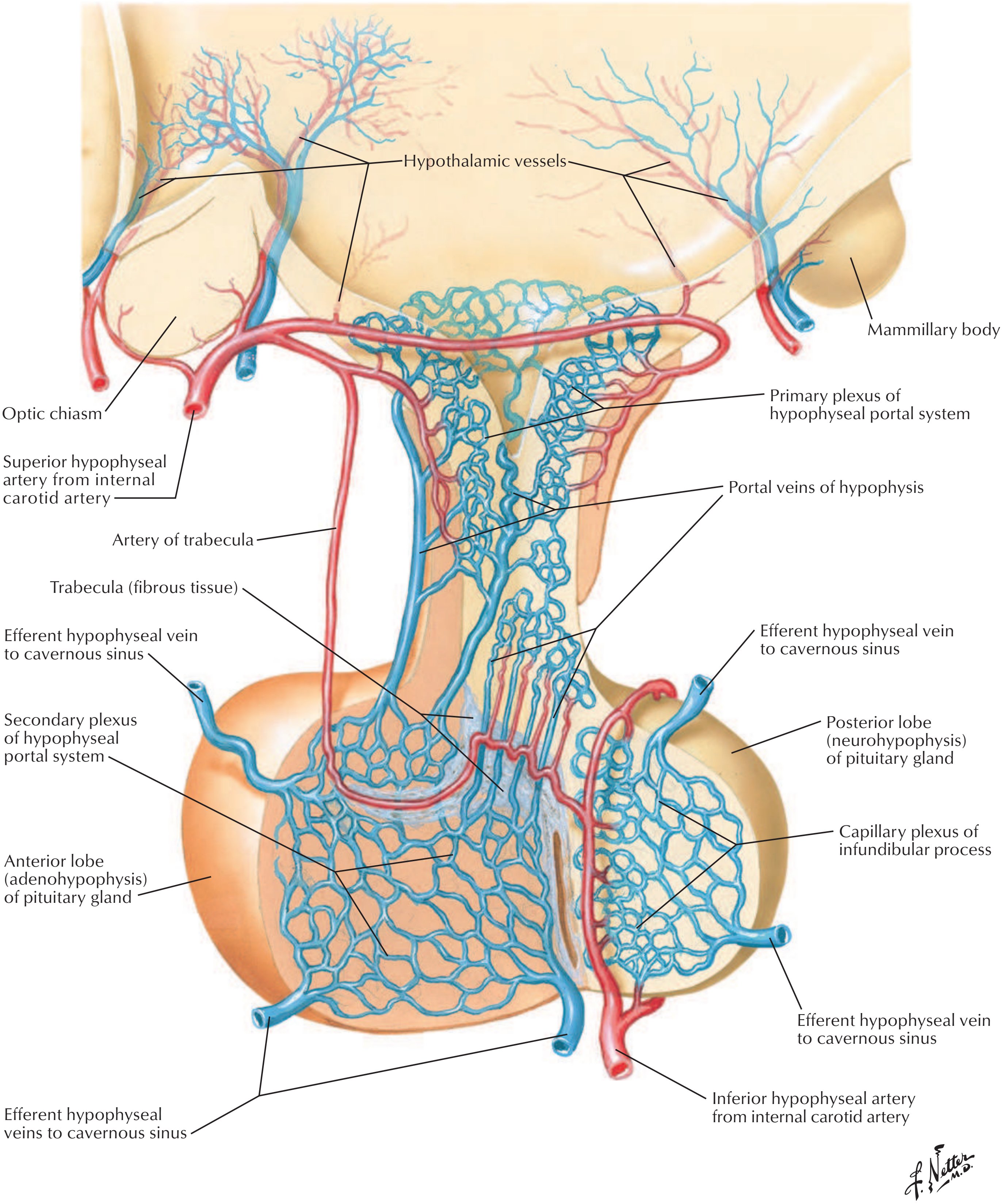
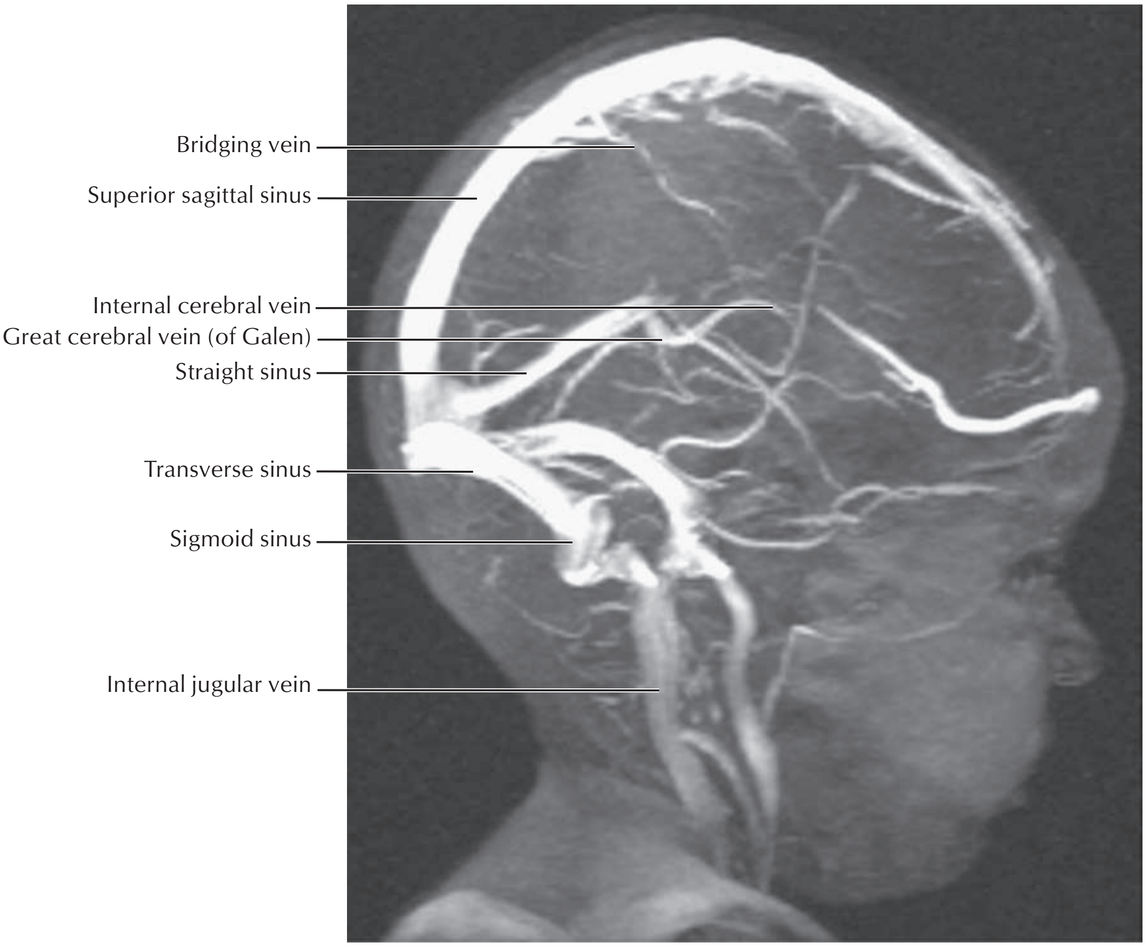
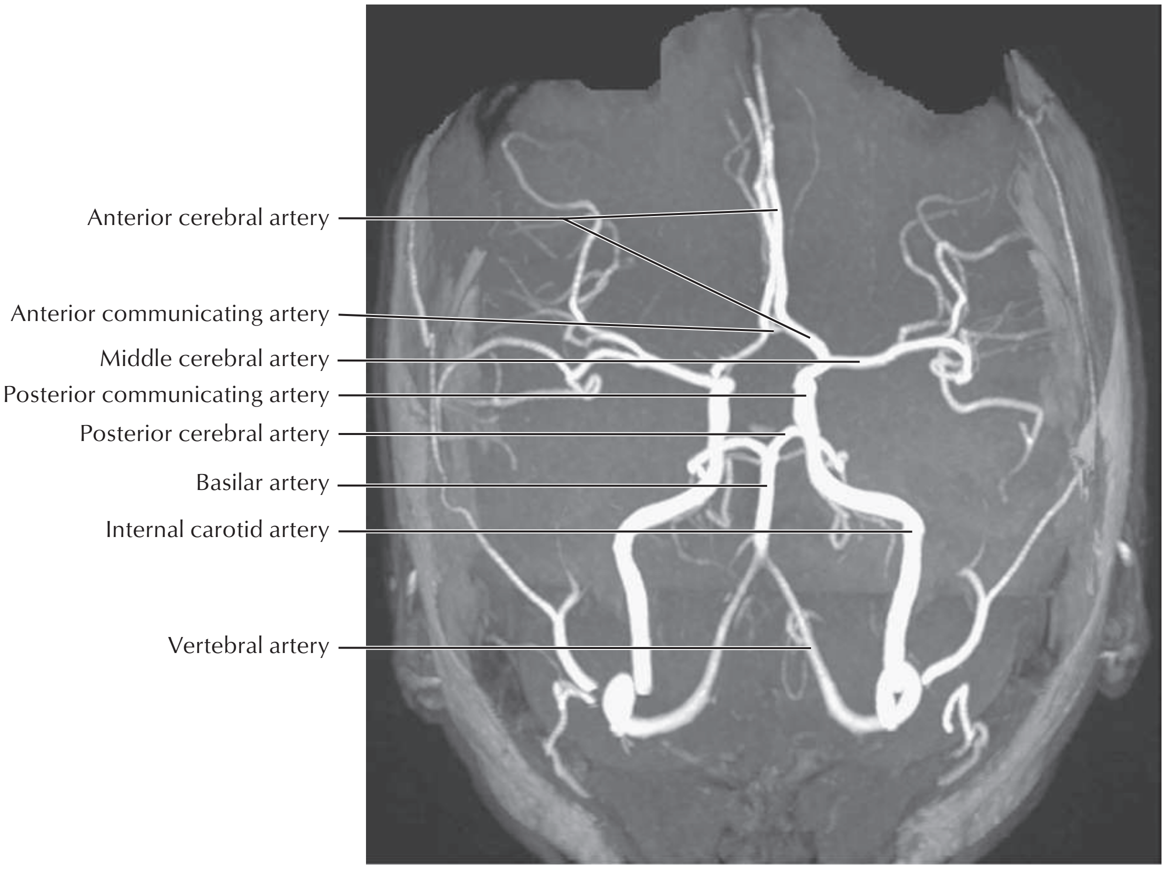
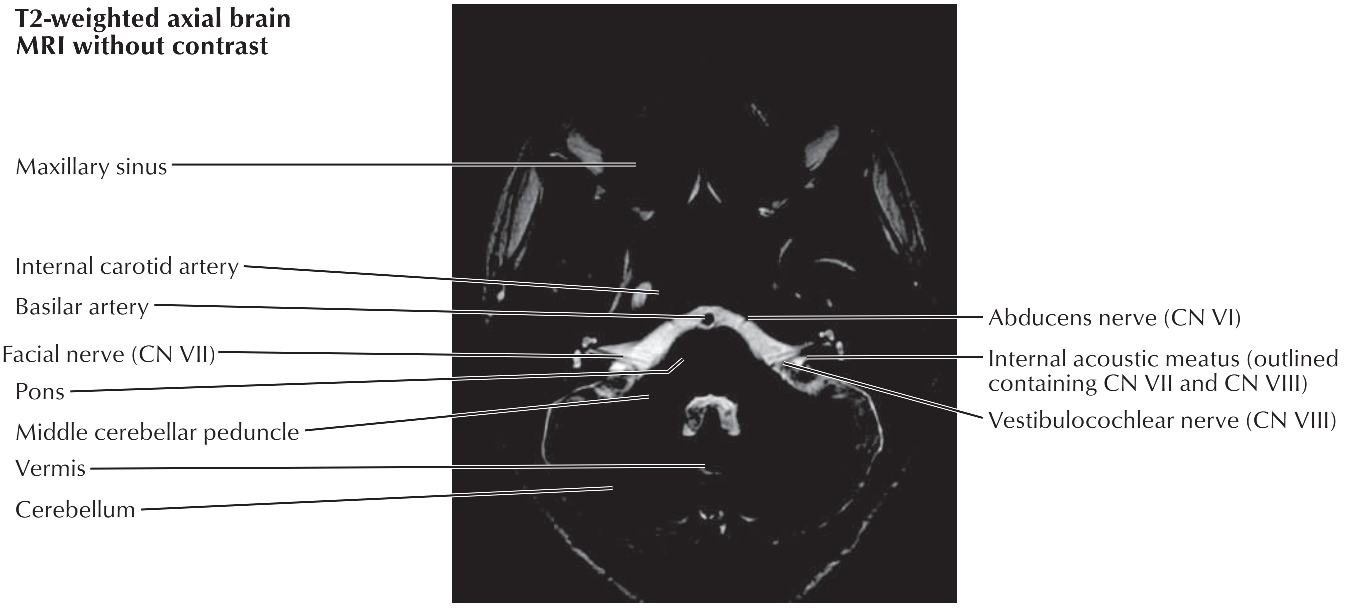
Arteries and Veins of Hypothalamus and Hypophysis


Hypothalamic vessels
Mammillary body
Optic chiasm
Primary plexus of hypophyseal portal system
Superior hypophyseal artery from internal carotid artery
Portal veins of hypophysis
Artery of trabecula
Trabecula (fibrous tissue)
Efferent hypophyseal vein to cavernous sinus
Efferent hypophyseal vein to cavernous sinus
Secondary plexus of hypophyseal portal system
Posterior lobe (neurohypophysis) of pituitary gland
Capillary plexus of infundibular process
Anterior lobe (adenohypophysis) of pituitary gland
Efferent hypophyseal vein to cavernous sinus
Inferior hypophyseal artery from internal carotid artery
Efferent hypophyseal veins to cavernous sinus

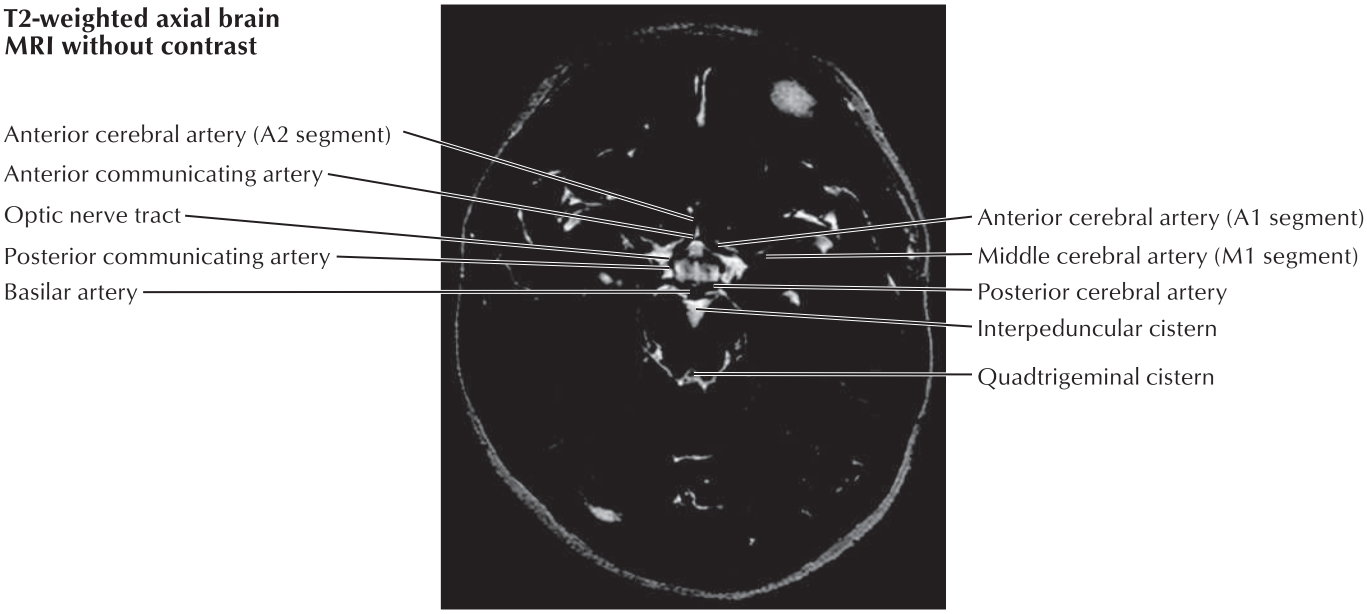

Bridging vein
Superior sagittal sinus
Internal cerebral vein
Great cerebral vein (of Galen)
Straight sinus
Transverse sinus
Sigmoid sinus
Internal jugular vein


Anterior cerebral artery
Anterior communicating artery
Middle cerebral artery
Posterior communicating artery
Posterior cerebral artery
Basilar artery
Internal carotid artery
Vertebral artery

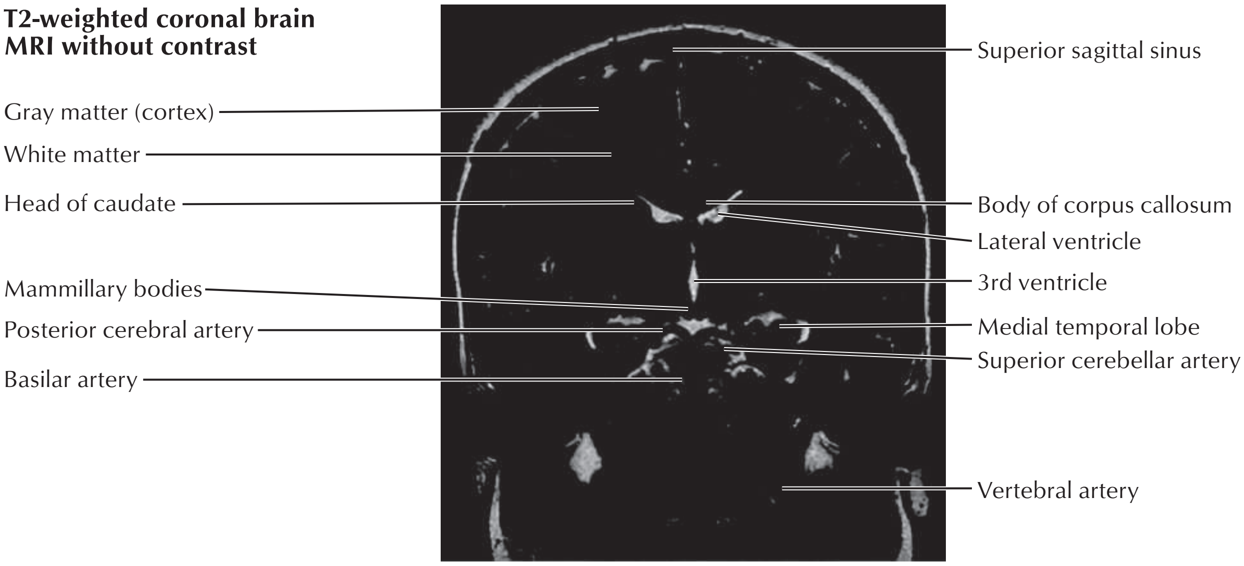
T2-weighted axial brain MRI without contrast


Maxillary sinus
Internal carotid artery
Basilar artery
Facial nerve (CN VII)
Pons
Middle cerebellar peduncle
Vermis
Cerebellum
Abducens nerve (CN VI)
Internal acoustic meatus (outlined containing CN VII and CN VIII)
Vestibulocochlear nerve (CN VIII)

T2-weighted axial brain MRI without contrast


Anterior cerebral artery (A2 segment)
Anterior communicating artery
Optic nerve tract
Posterior communicating artery
Basilar artery
Anterior cerebral artery (A1 segment)
Middle cerebral artery (M1 segment)
Posterior cerebral artery
Interpeduncular cistern
Quadrigeminal cistern

T2-weighted coronal brain MRI without contrast


Superior sagittal sinus
Gray matter (cortex)
White matter
Head of caudate
Body of corpus callosum
Lateral ventricle
3rd ventricle
Mammillary bodies
Posterior cerebral artery
Medial temporal lobe
Superior cerebellar artery
Basilar artery
Vertebral artery

BACK AND SPINAL CORD

3

Surface Anatomy 161
Bones and Ligaments 162-168
Spinal Cord 169-179
Muscles and Nerves 180-184
Cross-Sectional Anatomy 185-186
Structures With High Clinical Significance Table 3.1
Muscle Tables Tables 3.2-3.3
Electronic Bonus Plates BP33-BP43

ELECTRONIC BONUS PLATES

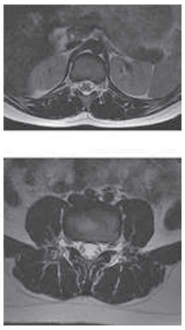
BP33 Vertebral Ligaments

BP34 Cervical Spine: Radiographs

BP35 Cervical Spine: MRI and Radiograph

BP36 Thoracolumbar Spine: Lateral Radiograph

BP37 Lumbar Vertebrae: Radiographs

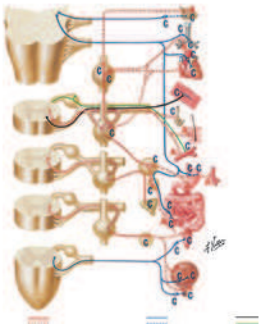


BP38 Lumbar Spine: MRIs

BP39 Sympathetic Nervous System: General Topography

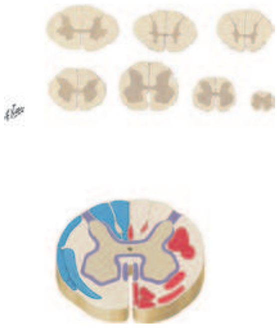
BP40 Parasympathetic Nervous System: General Topography

ELECTRONIC BONUS PLATES—*cont'd*



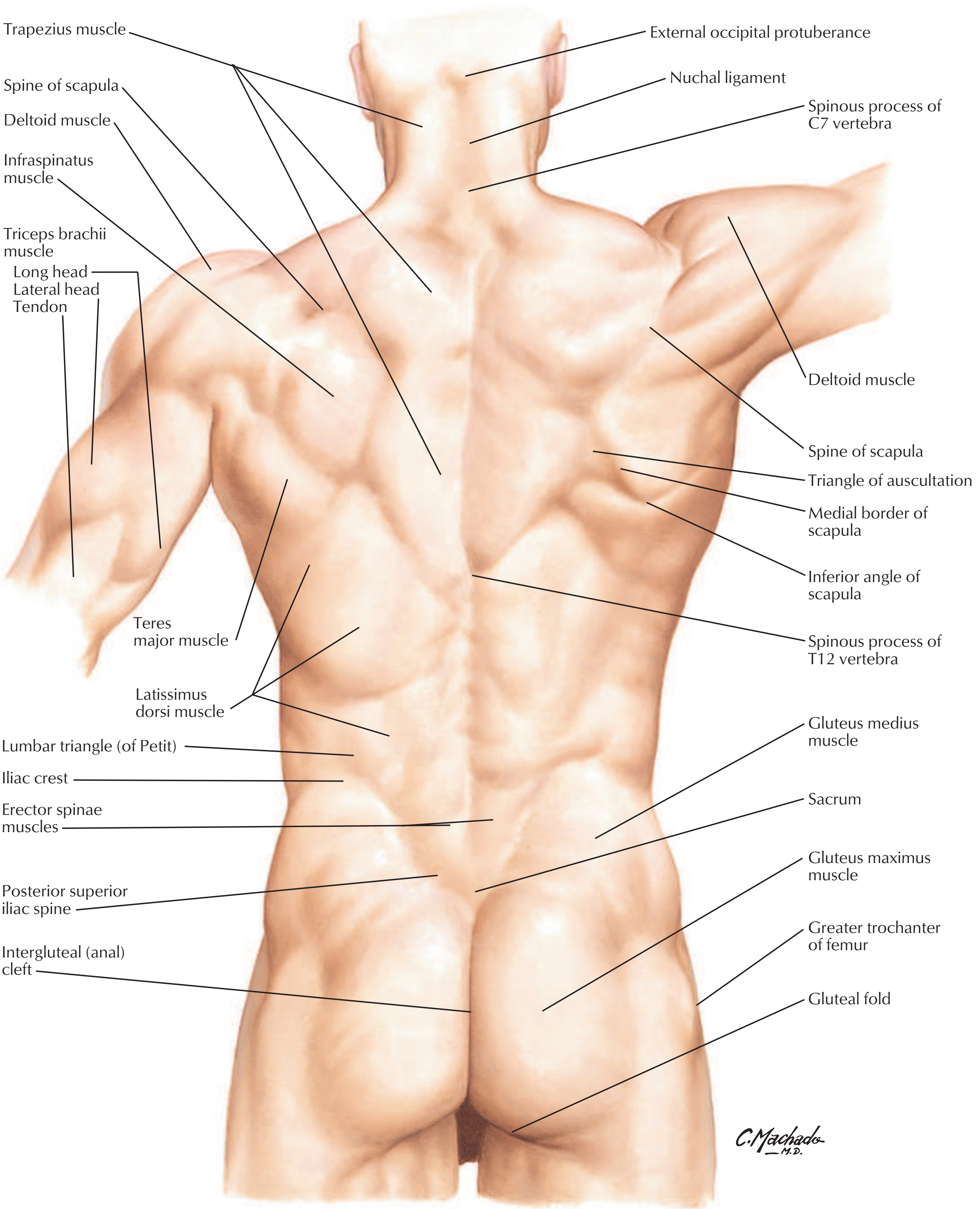
BP41 Cholinergic and Adrenergic Synapses: Schema

BP42 Vertebral Veins: Detail Showing Venous Communications



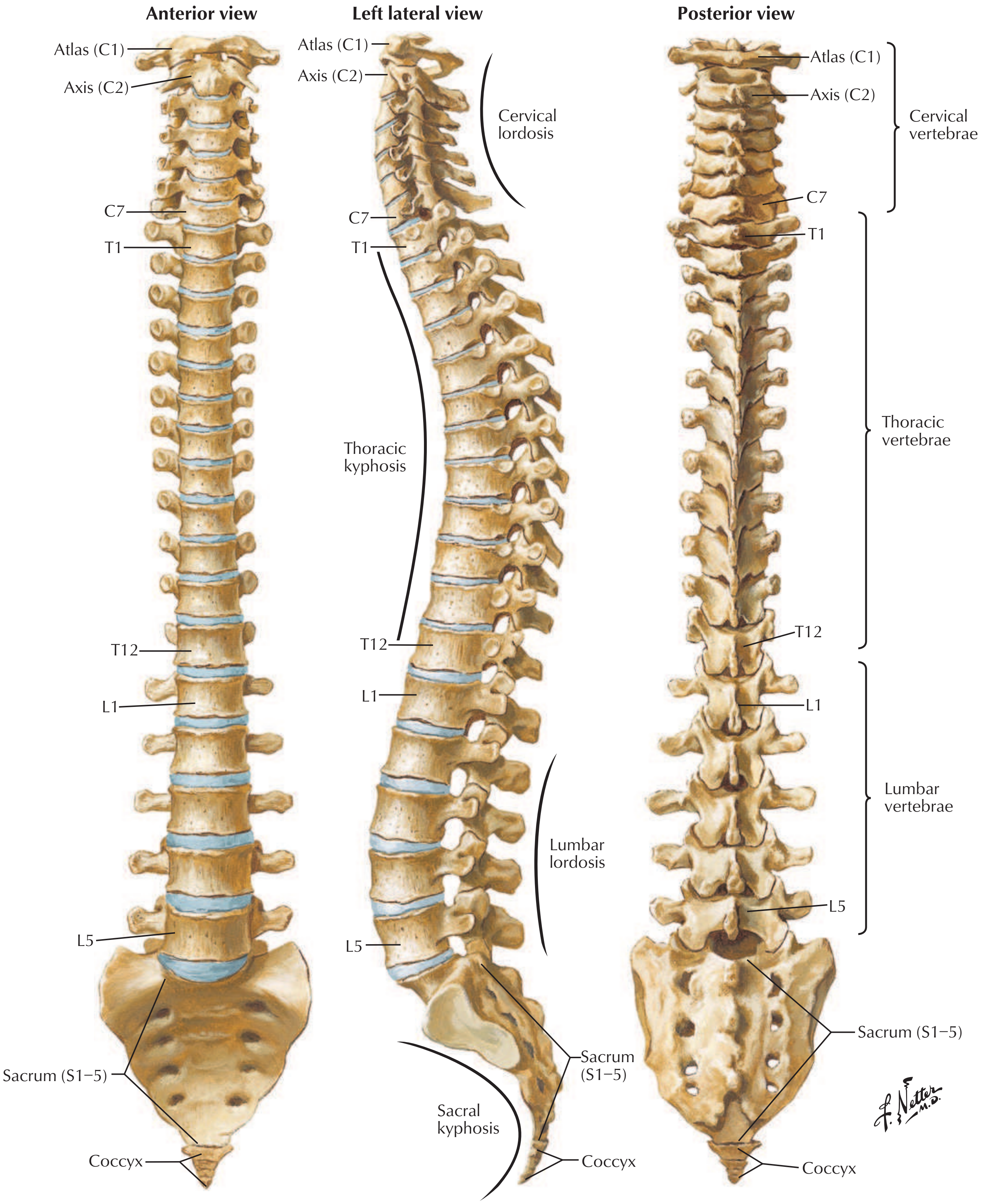
BP43 Spinal Cord Cross Sections: Fiber Tracts

See also Plates 162, 171, 180


Trapezius muscle
Spine of scapula
Deltoid muscle
Infraspinatus muscle
Triceps brachii muscle
Long head
Lateral head
Tendon
Teres major muscle
Latissimus dorsi muscle
Lumbar triangle (of Petit)
Iliac crest
Erector spinae muscles
Posterior superior iliac spine
Intergluteal (anal) cleft
External occipital protuberance
Nuchal ligament
Spinous process of C7 vertebra
Deltoid muscle
Spine of scapula
Triangle of auscultation
Medial border of scapula
Inferior angle of scapula
Spinous process of T12 vertebra
Gluteus medius muscle
Sacrum
Gluteus maximus muscle
Greater trochanter of femur
Gluteal fold
C. Machado M.D.

Vertebral Column

See also Plates 28, 192, 250


Anterior view
Atlas (C1)
Axis (C2)
C7
T1
T12
L1
L5
Sacrum (S1–5)
Coccyx
Left lateral view
Atlas (C1)
Axis (C2)
Cervical lordosis
C7
T1
Thoracic kyphosis
T12
L1
Lumbar lordosis
L5
Sacrum (S1–5)
Sacral kyphosis
Coccyx
Posterior view
Atlas (C1)
Axis (C2)
Cervical vertebrae
C7
T1
Thoracic vertebrae
T12
L1
Lumbar vertebrae
L5
Sacrum (S1–5)
Coccyx
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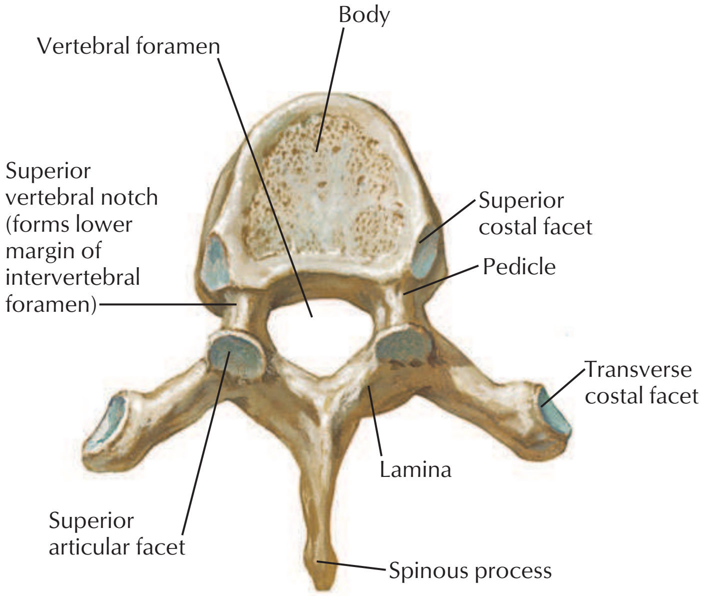
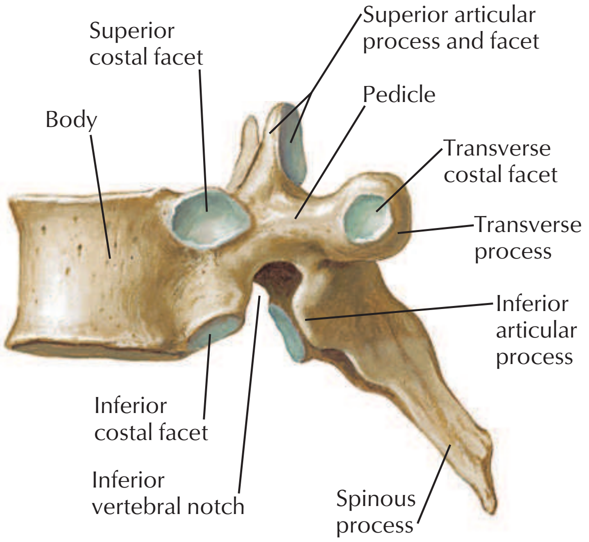
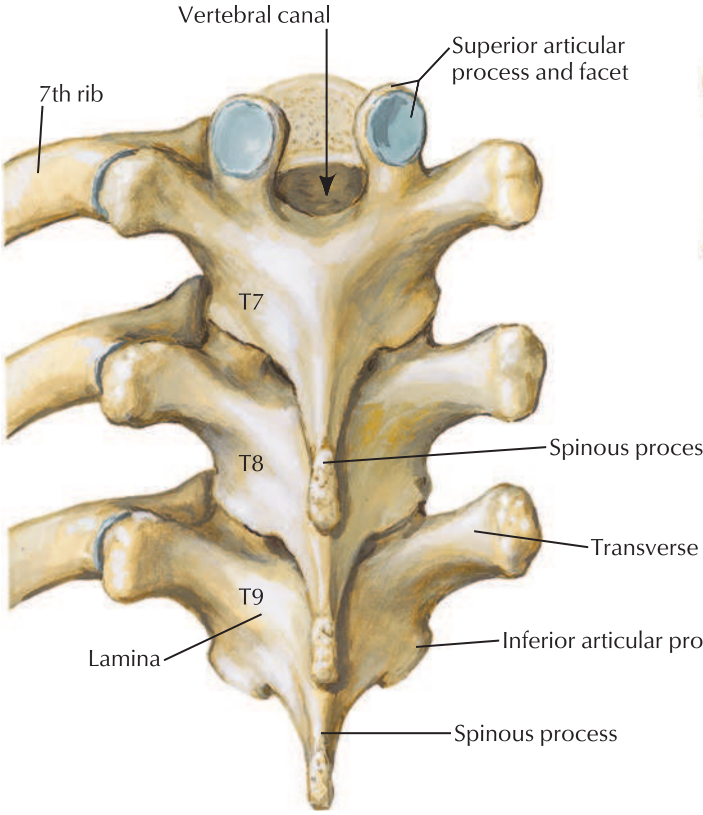

Body
Vertebral foramen
Superior vertebral notch (forms lower margin of intervertebral foramen)
Superior costal facet
Pedicle
Transverse costal facet
Lamina
Superior articular facet
Spinous process

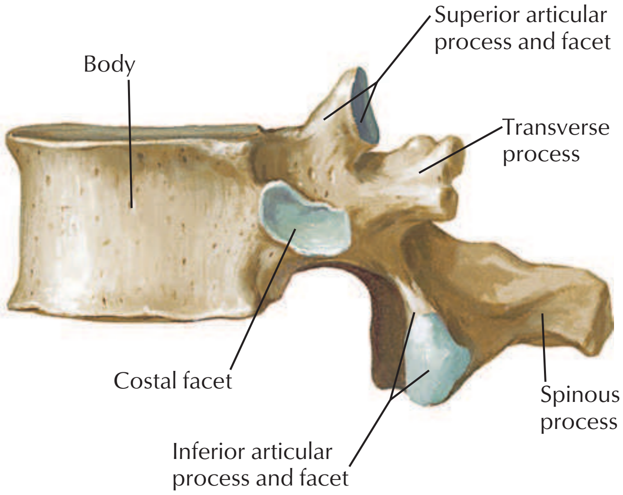
T6 vertebra: superior view


Superior costal facet
Superior articular process and facet
Pedicle
Body
Transverse costal facet
Transverse process
Inferior articular process
Inferior costal facet
Inferior vertebral notch
Spinous process

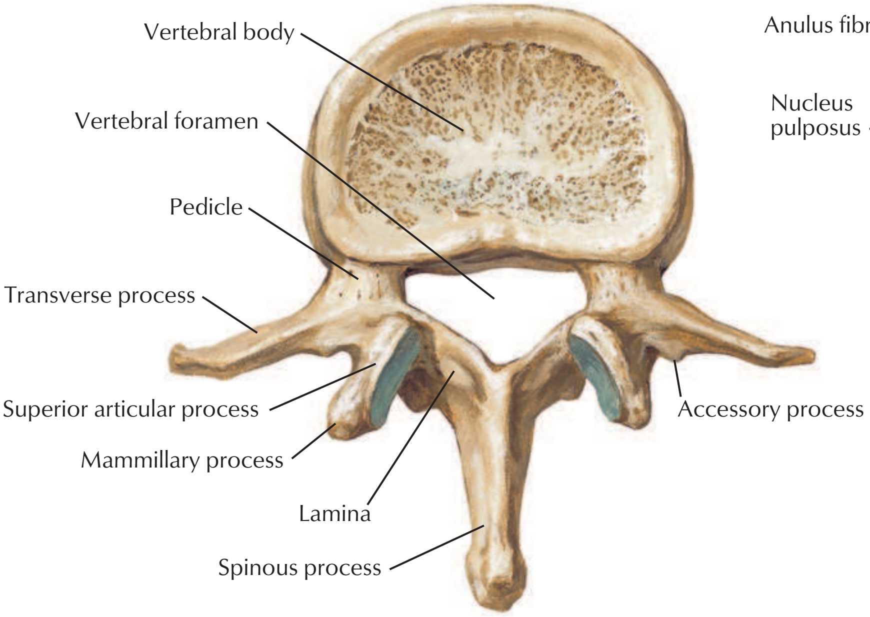
T6 vertebra: lateral view


Vertebral canal
Superior articular process and facet
7th rib
T7
T8
Spinous process
Transverse process
T9
Lamina
Inferior articular process
Spinous process

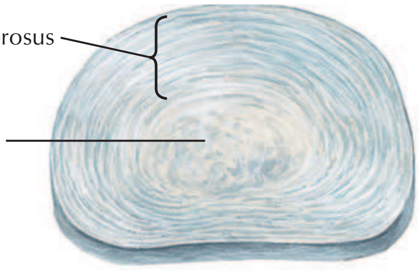
T7, T8, and T9 vertebrae: posterior view


Superior articular process and facet
Body
Transverse process
Costal facet
Spinous process
Inferior articular process and facet

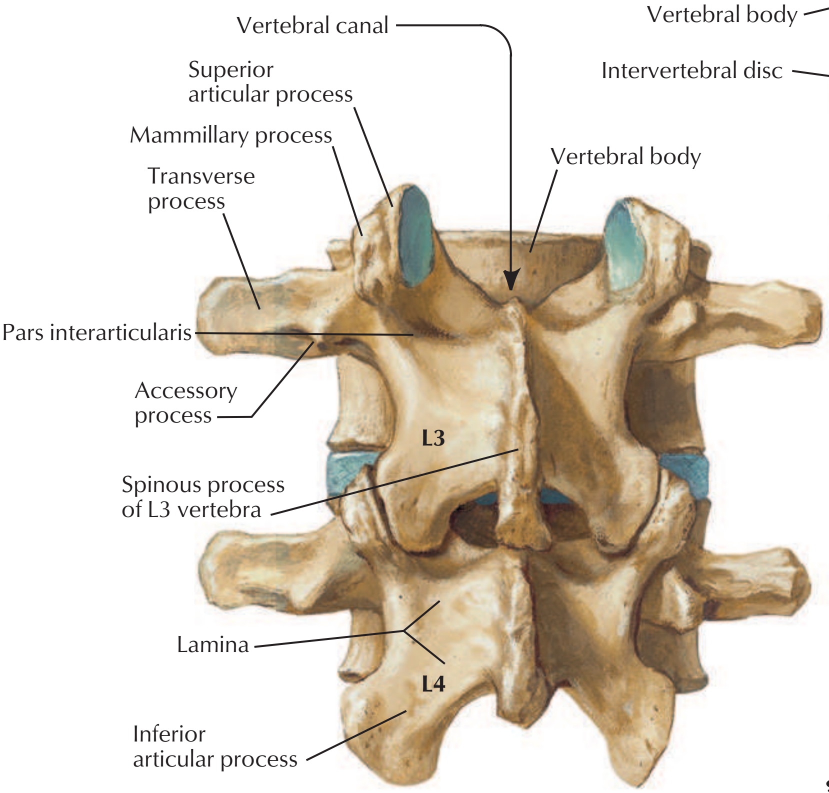
T12 vertebra: lateral view


Vertebral body
Vertebral foramen
Pedicle
Transverse process
Superior articular process
Mammillary process
Lamina
Spinous process
Accessory process

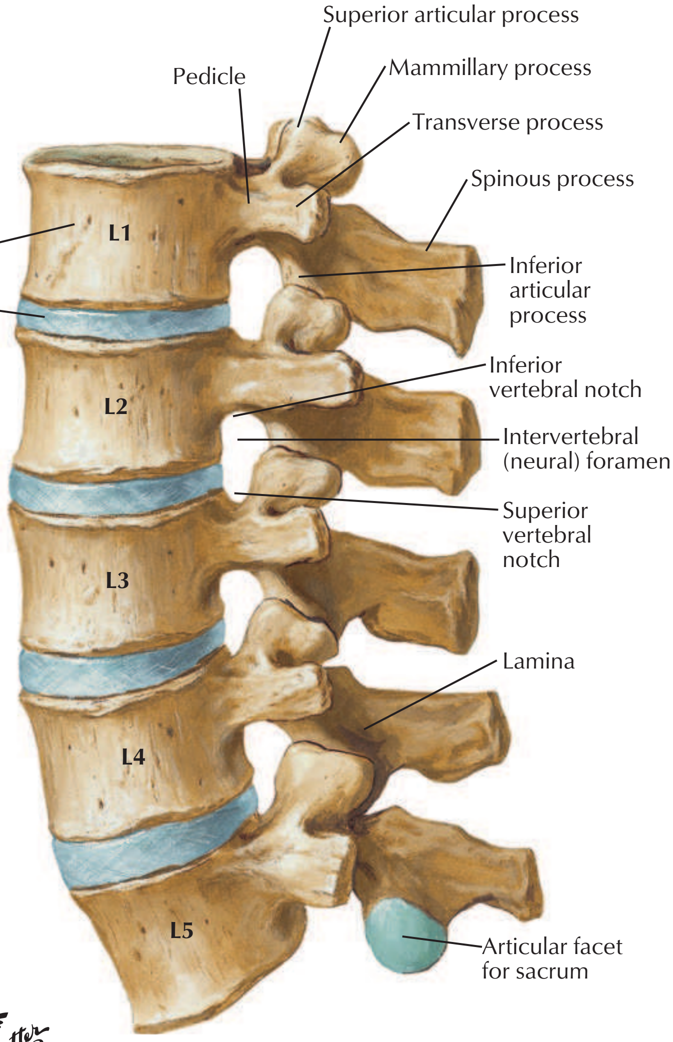
L2 vertebra: superior view


Anulus fibrosus
Nucleus pulposus

Intervertebral disc


Vertebral canal
Superior articular process
Mammillary process
Transverse process
Vertebral body
Pars interarticularis
Accessory process
L3
Spinous process of L3 vertebra
Lamina
L4
Inferior articular process

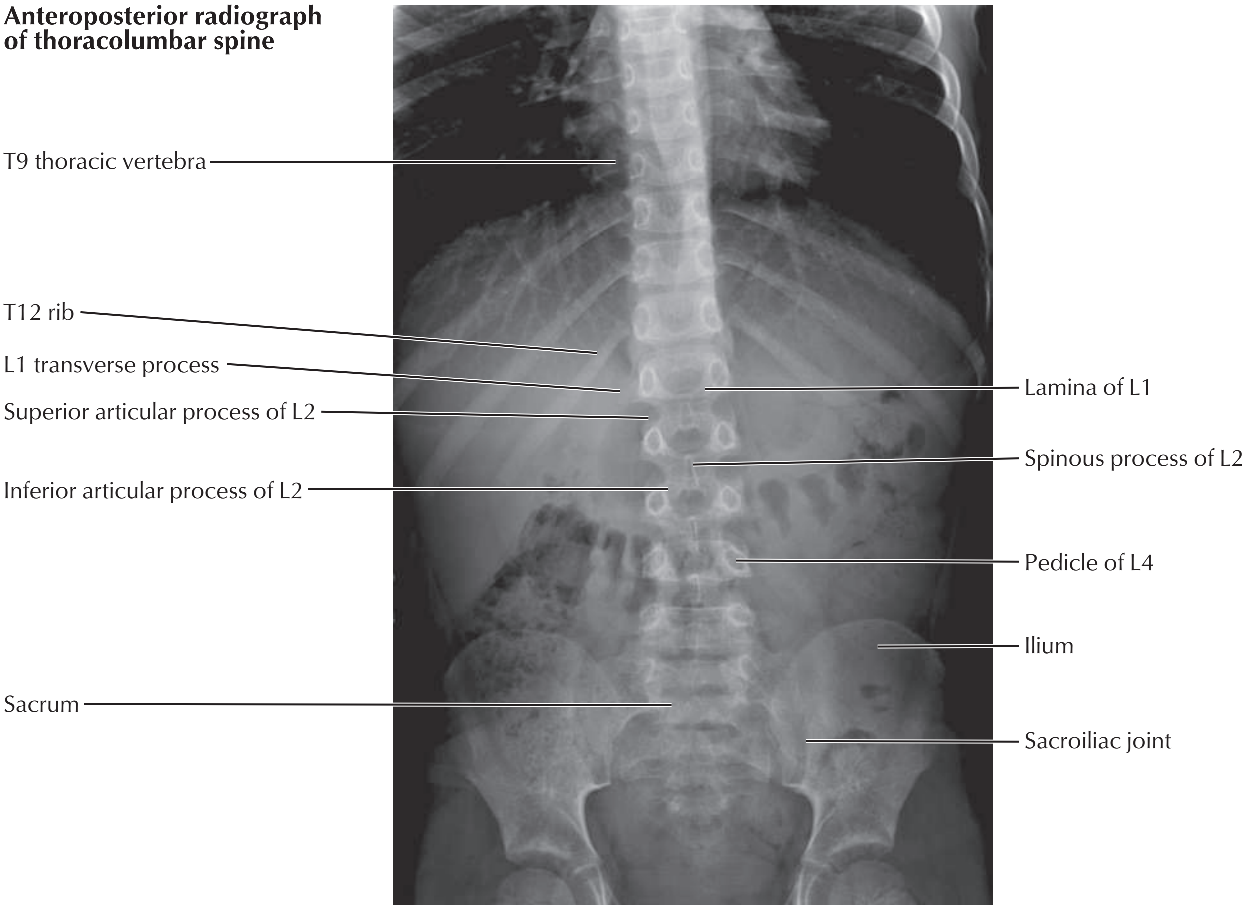
L3 and L4 vertebrae: posterior view


Superior articular process
Pedicle
Mammillary process
Transverse process
Spinous process
Vertebral body
L1
Inferior articular process
Intervertebral disc
Inferior vertebral notch
L2
Intervertebral (neural) foramen
Superior vertebral notch
L3
Lamina
L4
L5
Articular facet for sacrum

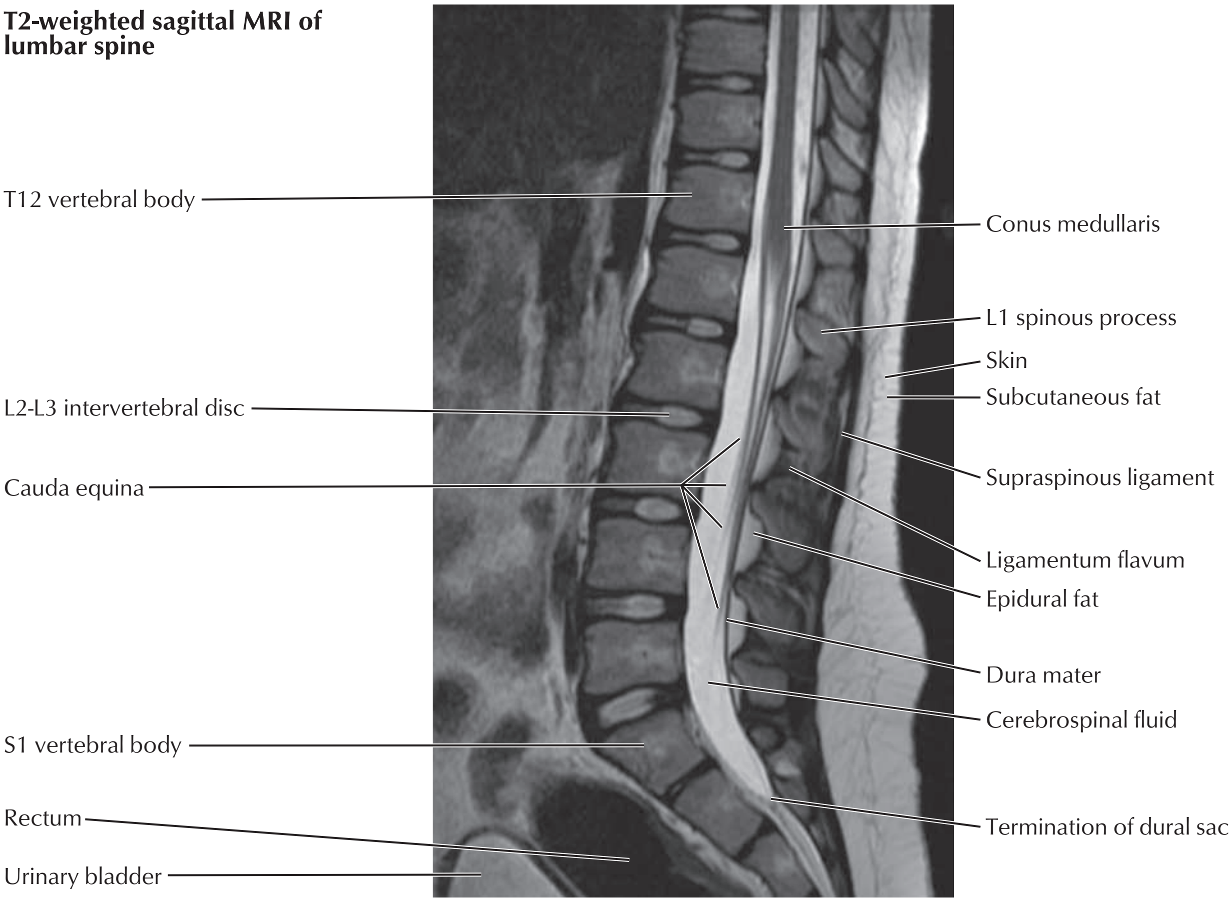
Lumbar vertebrae, articulated: left lateral view

See also Plates 162, 250

Anteroposterior radiograph of thoracolumbar spine

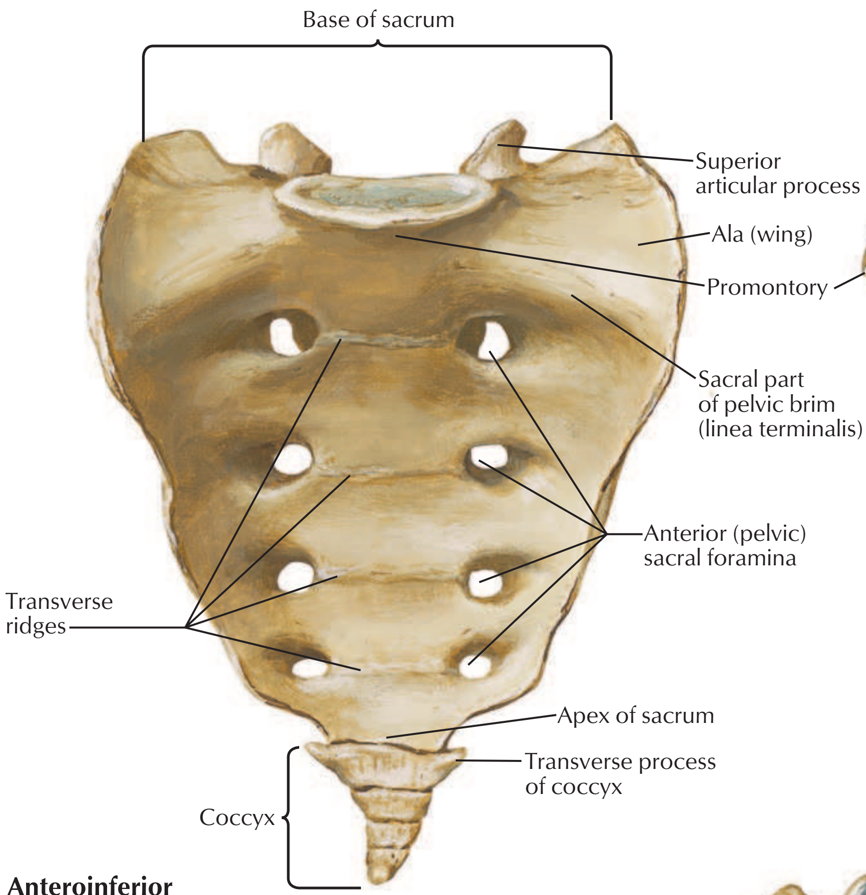

T9 thoracic vertebra
T12 rib
L1 transverse process
Superior articular process of L2
Inferior articular process of L2
Sacrum
Lamina of L1
Spinous process of L2
Pedicle of L4
Ilium
Sacroiliac joint

T2-weighted sagittal MRI of lumbar spine


T12 vertebral body
L2-L3 intervertebral disc
Cauda equina
S1 vertebral body
Rectum
Urinary bladder
Conus medullaris
L1 spinous process
Skin
Subcutaneous fat
Supraspinous ligament
Ligamentum flavum
Epidural fat
Dura mater
Cerebrospinal fluid
Termination of dural sac

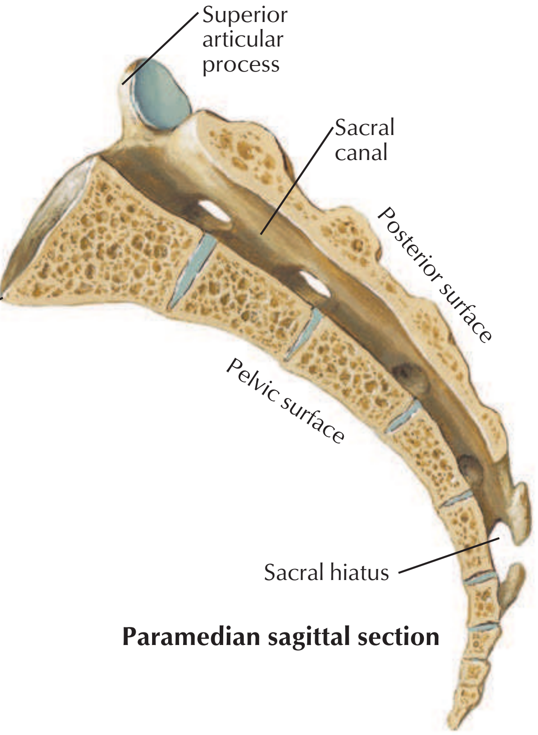
Sacrum and Coccyx

See also Plates 334, 338

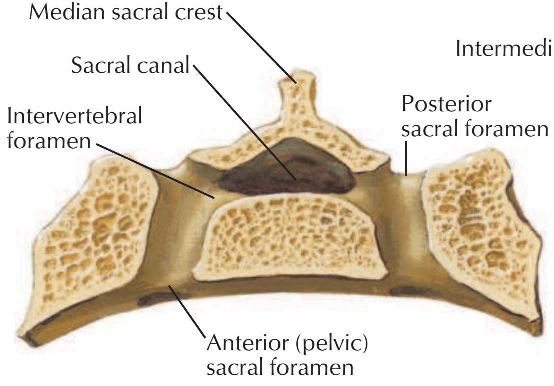

Base of sacrum
Superior articular process
Ala (wing)
Promontory
Sacral part of pelvic brim (linea terminalis)
Anterior (pelvic) sacral foramina
Transverse ridges
Apex of sacrum
Transverse process of coccyx
Coccyx

Anteroinferior view

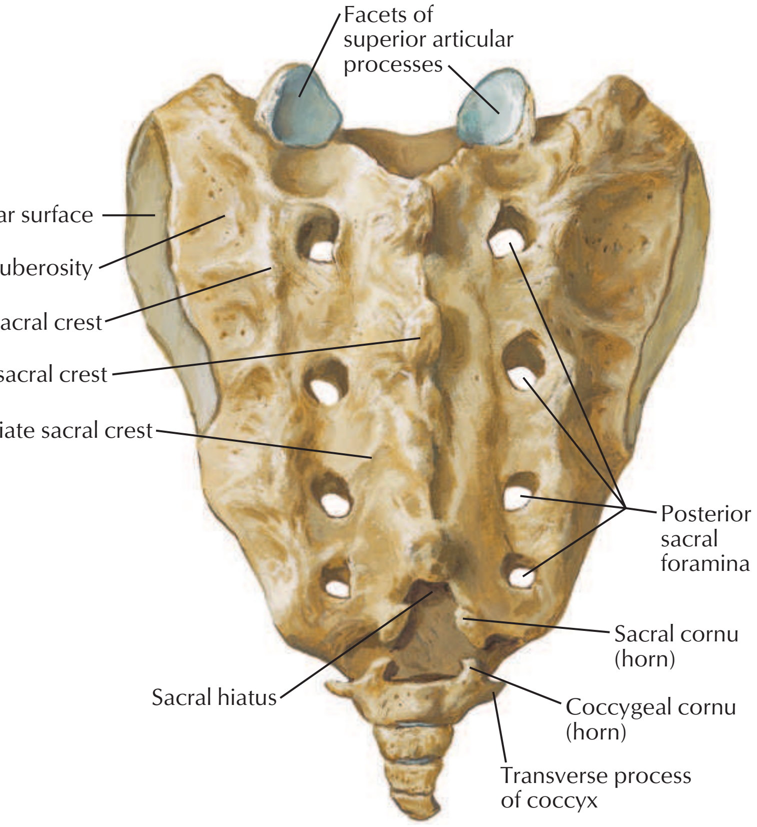
Pelvic surface


Superior articular process
Sacral canal
Posterior surface
Pelvic surface
Sacral hiatus

Paramedian sagittal section

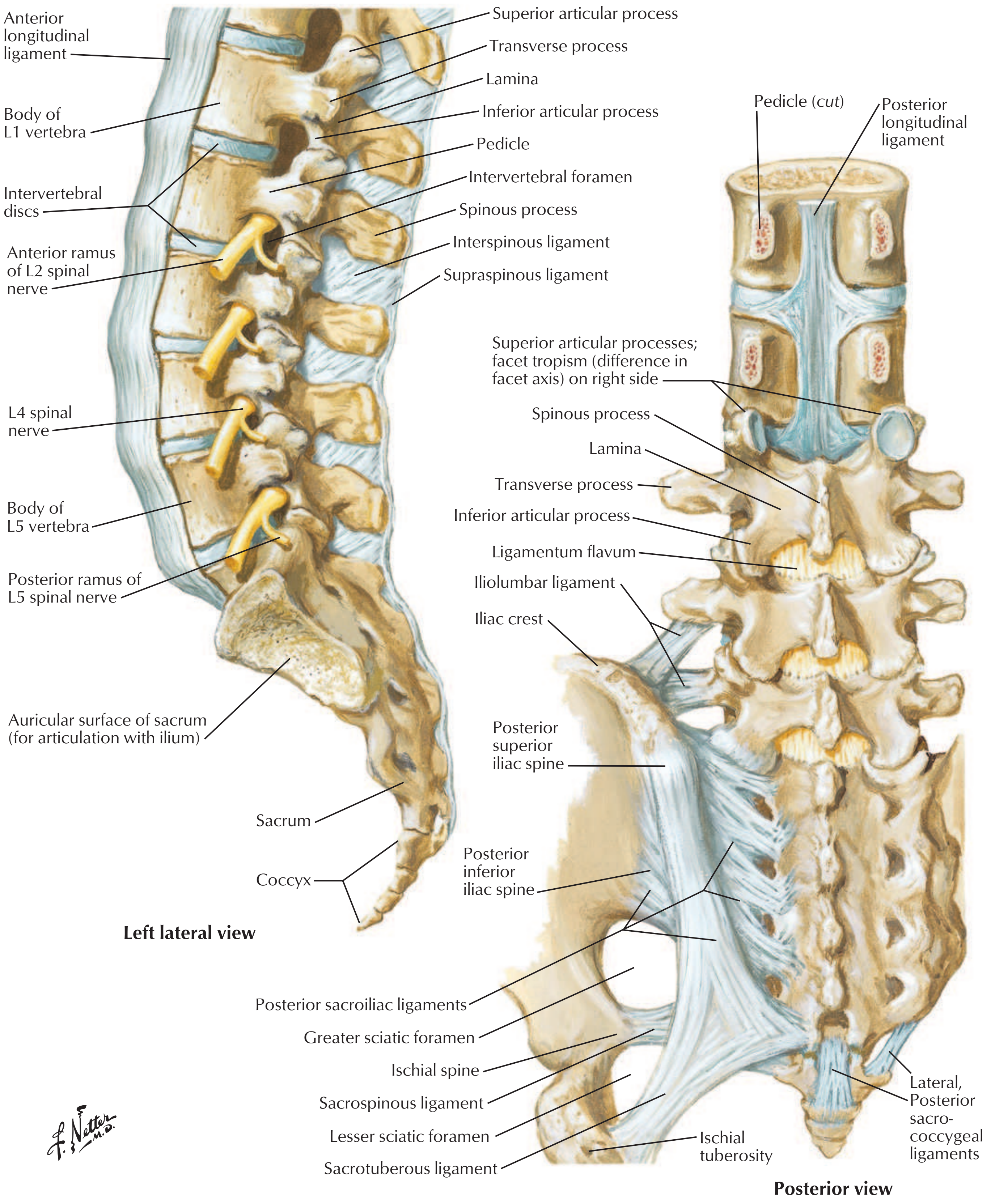

Median sacral crest
Sacral canal
Intervertebral foramen
Posterior sacral foramen
Anterior (pelvic) sacral foramen

Transverse section through S2 foramina


Facets of superior articular processes
Auricular surface
Sacral tuberosity
Lateral sacral crest
Median sacral crest
Intermediate sacral crest
Posterior sacral foramina
Sacral cornu (horn)
Sacral hiatus
Coccygeal cornu (horn)
Transverse process of coccyx

Posterosuperior view

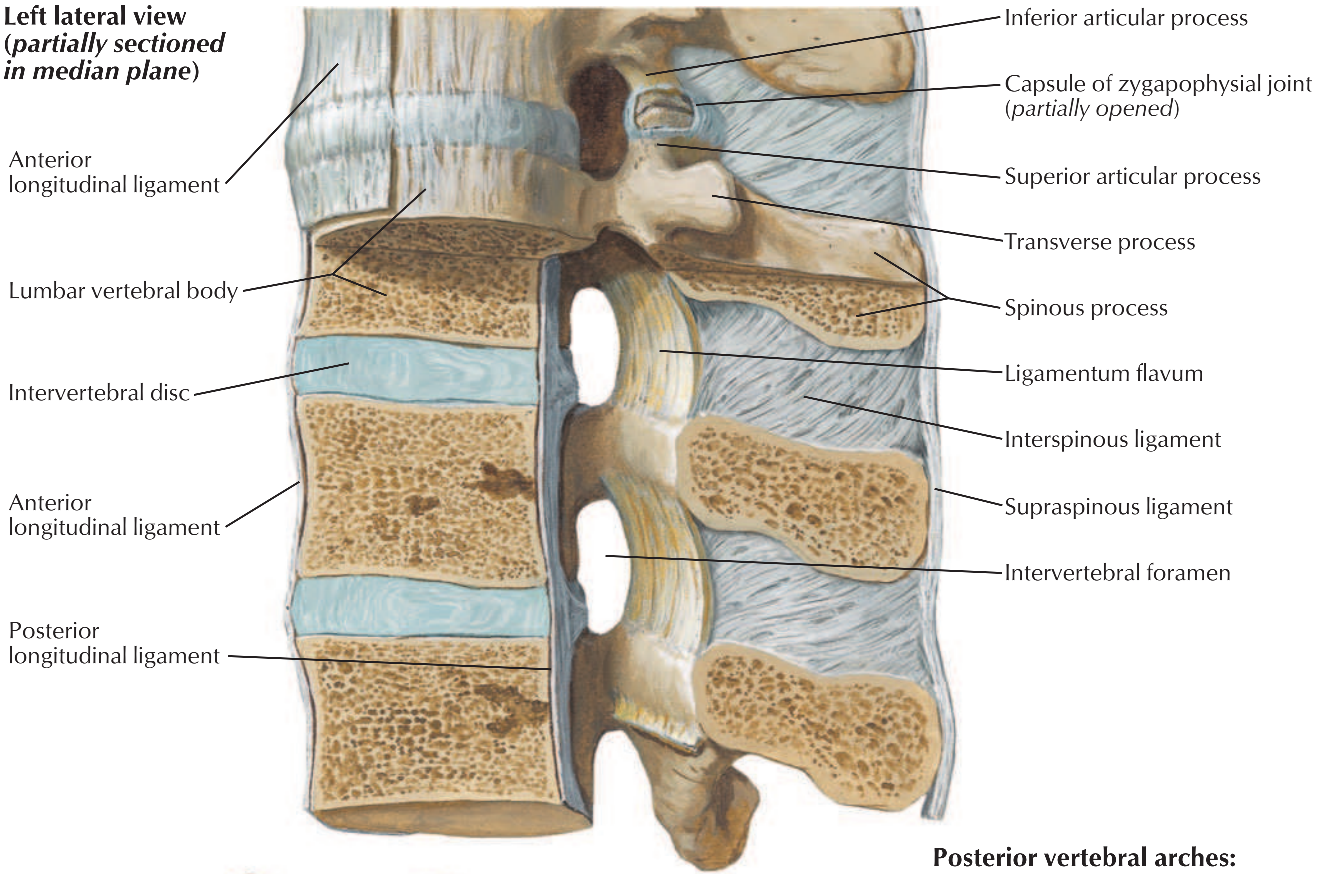
Vertebral Ligaments: Lumbosacral Region

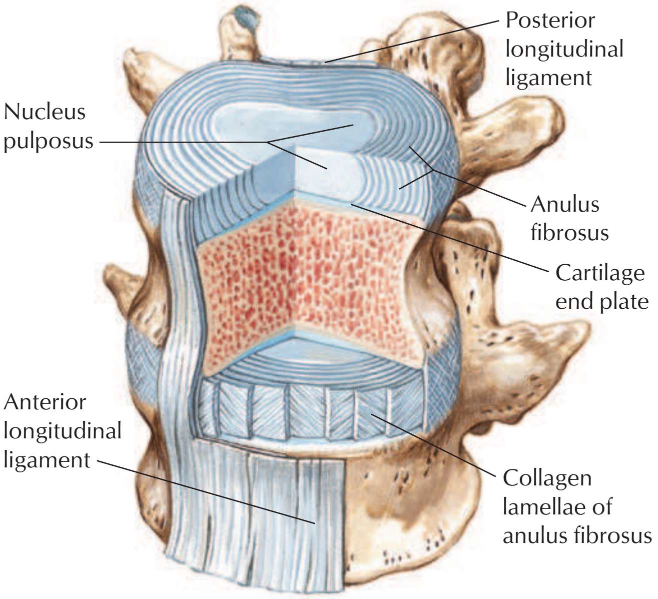

Anterior longitudinal ligament
Body of L1 vertebra
Intervertebral discs
Anterior ramus of L2 spinal nerve
L4 spinal nerve
Body of L5 vertebra
Posterior ramus of L5 spinal nerve
Auricular surface of sacrum (for articulation with ilium)
Sacrum
Coccyx
Superior articular process
Transverse process
Lamina
Inferior articular process
Pedicle
Intervertebral foramen
Spinous process
Interspinous ligament
Supraspinous ligament
Pedicle (cut)
Posterior longitudinal ligament
Superior articular processes; facet tropism (difference in facet axis) on right side
Spinous process
Lamina
Transverse process
Inferior articular process
Ligamentum flavum
Iliolumbar ligament
Iliac crest
Posterior superior iliac spine
Posterior inferior iliac spine
Posterior sacroiliac ligaments
Greater sciatic foramen
Ischial spine
Sacrospinous ligament
Lesser sciatic foramen
Sacrotuberous ligament
Ischial tuberosity
Lateral, Posterior sacro-coccygeal ligaments
F. Netter M.D.

Left lateral view

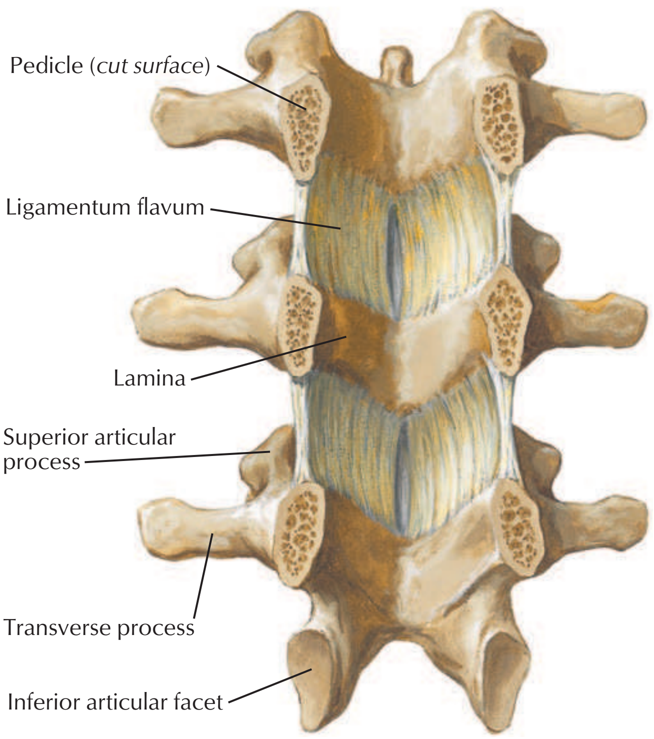
Posterior view

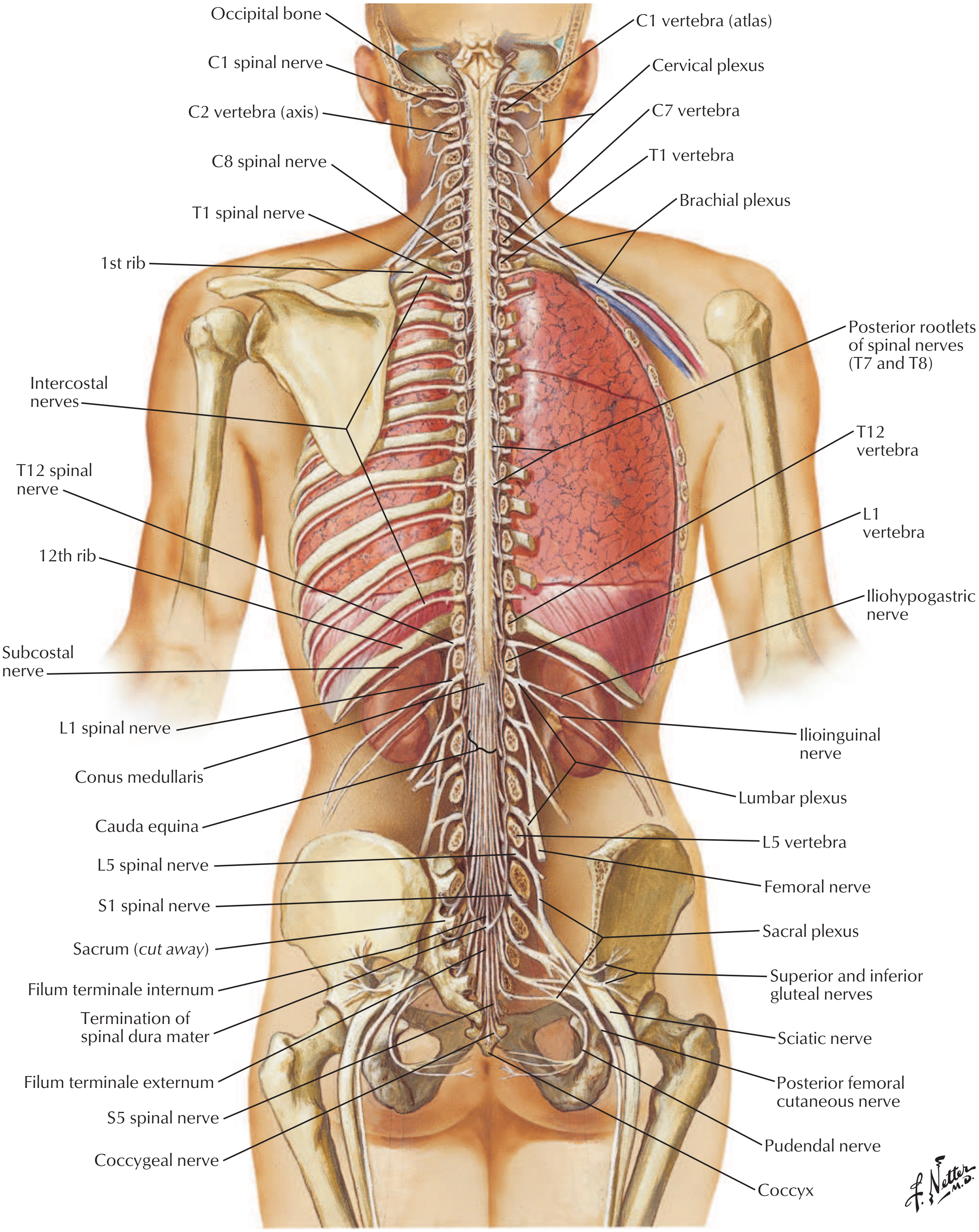
Vertebral Ligaments: Lumbar Region


Left lateral view (*partially sectioned in median plane*)
Anterior longitudinal ligament
Lumbar vertebral body
Intervertebral disc
Anterior longitudinal ligament
Posterior longitudinal ligament
Inferior articular process
Capsule of zygapophysial joint (*partially opened*)
Superior articular process
Transverse process
Spinous process
Ligamentum flavum
Interspinous ligament
Supraspinous ligament
Intervertebral foramen

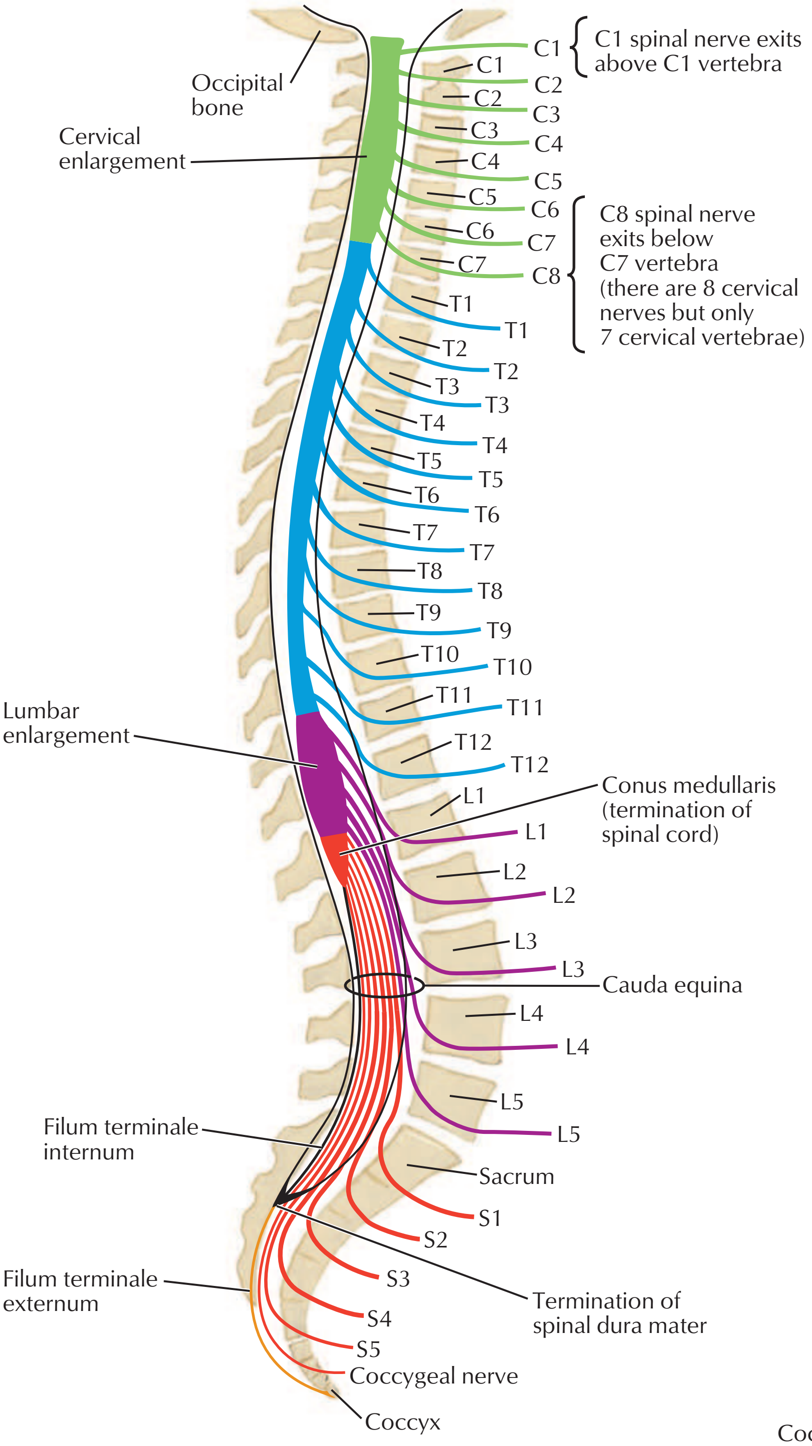

Posterior longitudinal ligament
Nucleus pulposus
Anulus fibrosus
Cartilage end plate
Anterior longitudinal ligament
Collagen lamellae of anulus fibrosus

Intervertebral disc composed of central nuclear zone of collagen and hydrated proteoglycans surrounded by concentric lamellae of collagen fibers


Posterior vertebral arches: anterior view
Pedicle (*cut surface*)
Ligamentum flavum
Lamina
Superior articular process
Transverse process
Inferior articular facet


Occipital bone
C1 spinal nerve
C2 vertebra (axis)
C8 spinal nerve
T1 spinal nerve
1st rib
Intercostal nerves
T12 spinal nerve
12th rib
Subcostal nerve
L1 spinal nerve
Conus medullaris
Cauda equina
L5 spinal nerve
S1 spinal nerve
Sacrum (*cut away*)
Filum terminale internum
Termination of spinal dura mater
Filum terminale externum
S5 spinal nerve
Coccygeal nerve
C1 vertebra (atlas)
Cervical plexus
C7 vertebra
T1 vertebra
Brachial plexus
Posterior rootlets of spinal nerves (T7 and T8)
T12 vertebra
L1 vertebra
Iliohypogastric nerve
Ilioinguinal nerve
Lumbar plexus
L5 vertebra
Femoral nerve
Sacral plexus
Superior and inferior gluteal nerves
Sciatic nerve
Posterior femoral cutaneous nerve
Pudendal nerve
Coccyx

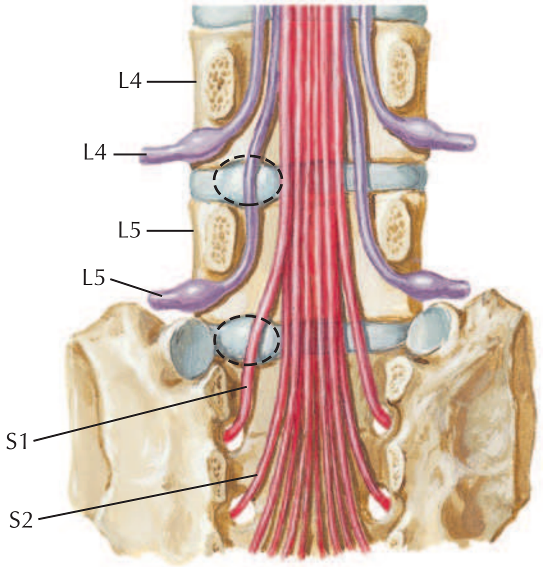
Relation of Spinal Nerve Roots to Vertebrae


Occipital bone
Cervical enlargement
C1
C2
C3
C4
C5
C6
C7
C1
C2
C3
C4
C5
C6
C7
C8
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
Lumbar enlargement
L1
L2
L3
L4
L5
L1
L2
L3
L4
L5
Conus medullaris (termination of spinal cord)
Cauda equina
Filum terminale internum
Sacrum
S1
S2
S3
S4
S5
Filum terminale externum
Termination of spinal dura mater
Coccygeal nerve
Coccyx

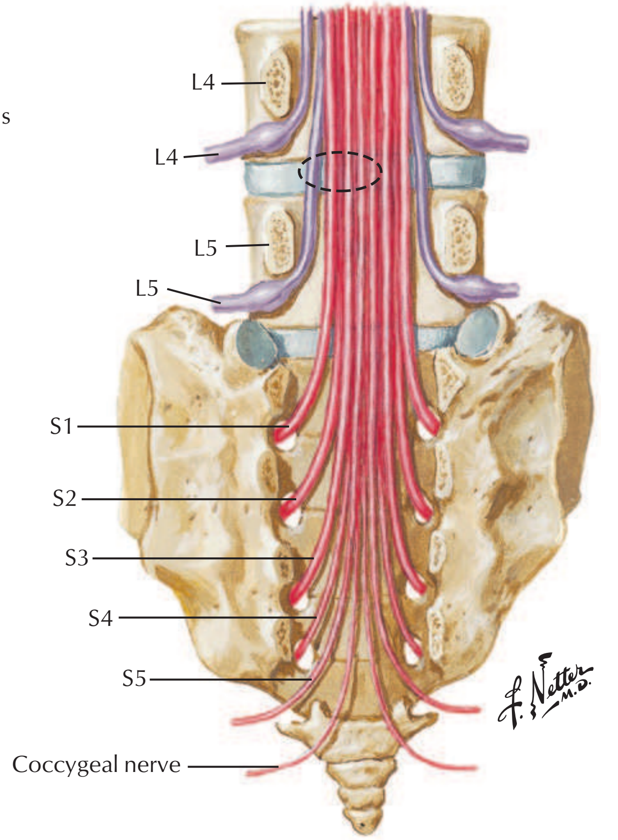
C1 spinal nerve exits above C1 vertebra

C8 spinal nerve exits below C7 vertebra (there are 8 cervical nerves but only 7 cervical vertebrae)

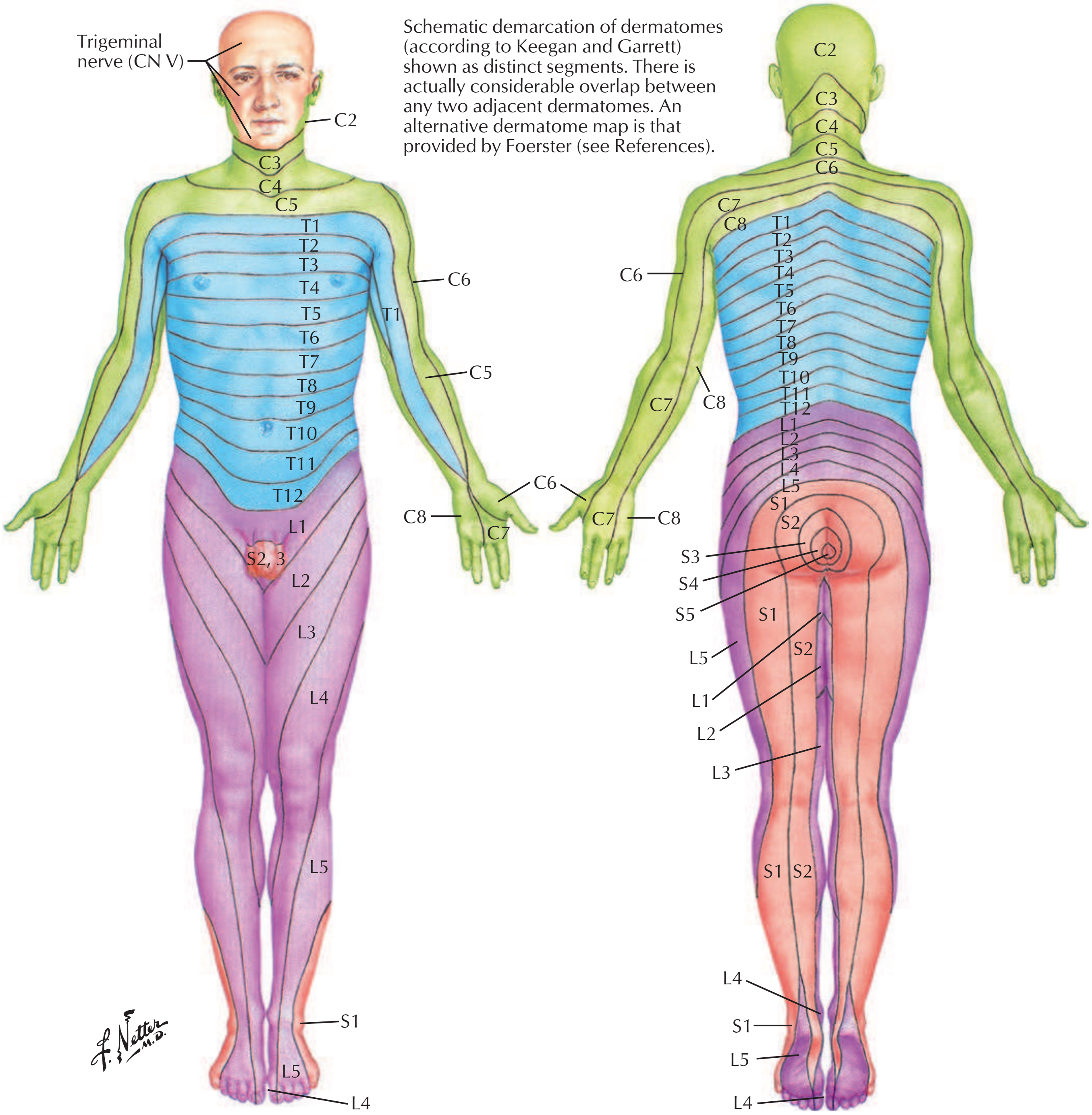
🟩 **Cervical nerves**
🟦 **Thoracic nerves**
🟪 **Lumbar nerves**
🟥 **Sacral and coccygeal nerves**


L4
L4
L5
L5
S1
S2

Lumbar disc protrusion (*dashed ovals*) does not usually affect nerve exiting above disc. Lateral protrusion at disc level L4–5 affects L5 spinal nerve, not L4 spinal nerve. Protrusion at disc level L5–S1 affects S1 spinal nerve, not L5 spinal nerve.


L4
L4
L5
L5
S1
S2
S3
S4
S5
Coccygeal nerve

Medial protrusion at disc level L4–5 (*dashed oval*) rarely affects L4 spinal nerve but might affect L5 spinal nerve and sometimes S1–4 spinal nerves.


Trigeminal nerve (CN V)
C2
C3
C4
C5
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
L1
S2, 3
L2
L3
L4
L5
S1
L5
L4
C6
T1
C5
C6
C8
C7
F. Netter M.D.
C2
C3
C4
C5
C6
C7
C8
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
L1
L2
L3
L4
L5
S1
S2
C6
C7
C8
C6
C7
C8
S3
S4
S5
S1
L5
S2
L1
L2
L3
S1
S2
L4
S1
L5
L4

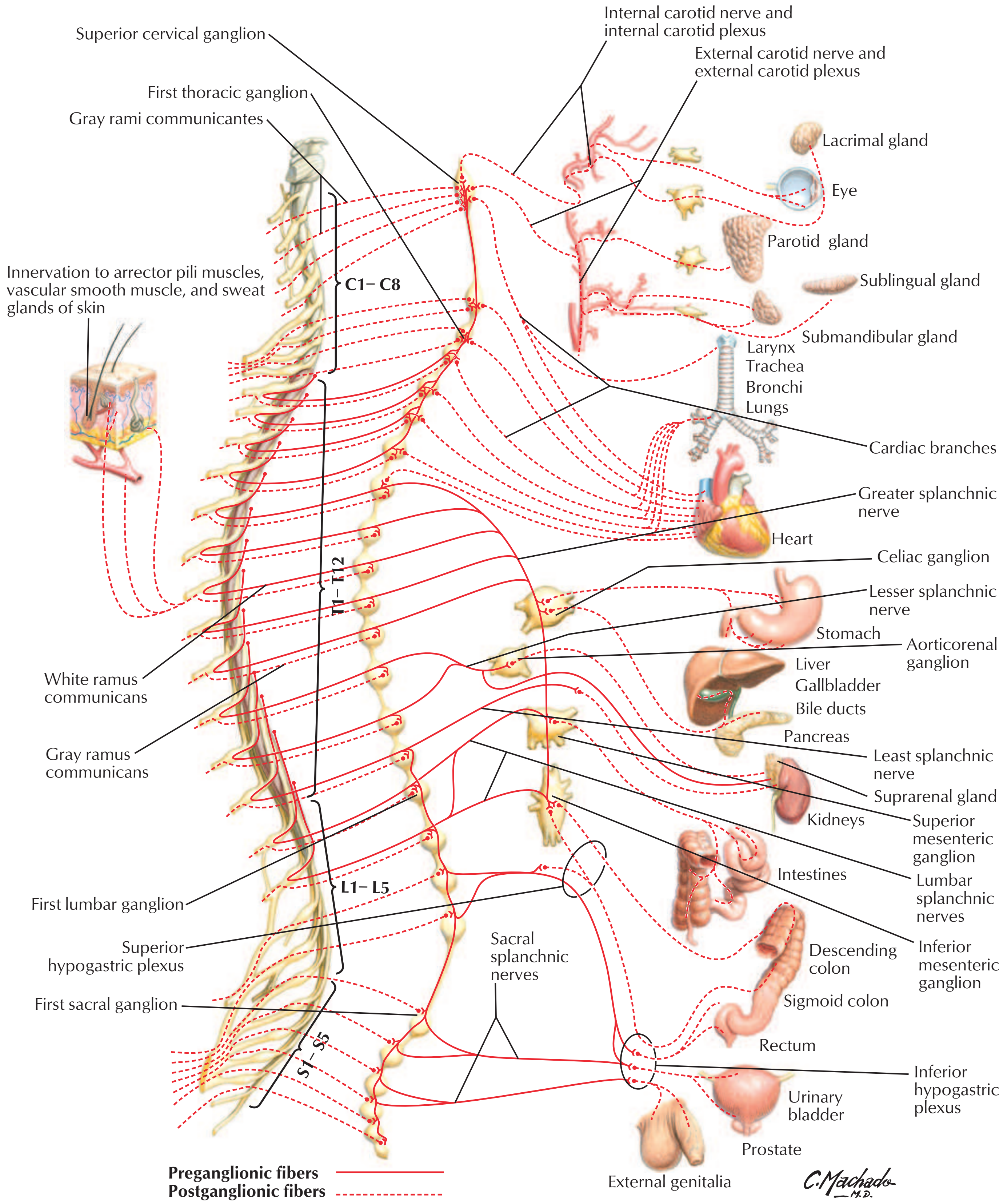
Schematic demarcation of dermatomes (according to Keegan and Garrett) shown as distinct segments. There is actually considerable overlap between any two adjacent dermatomes. An alternative dermatome map is that provided by Foerster (see References).

Levels of principal dermatomes

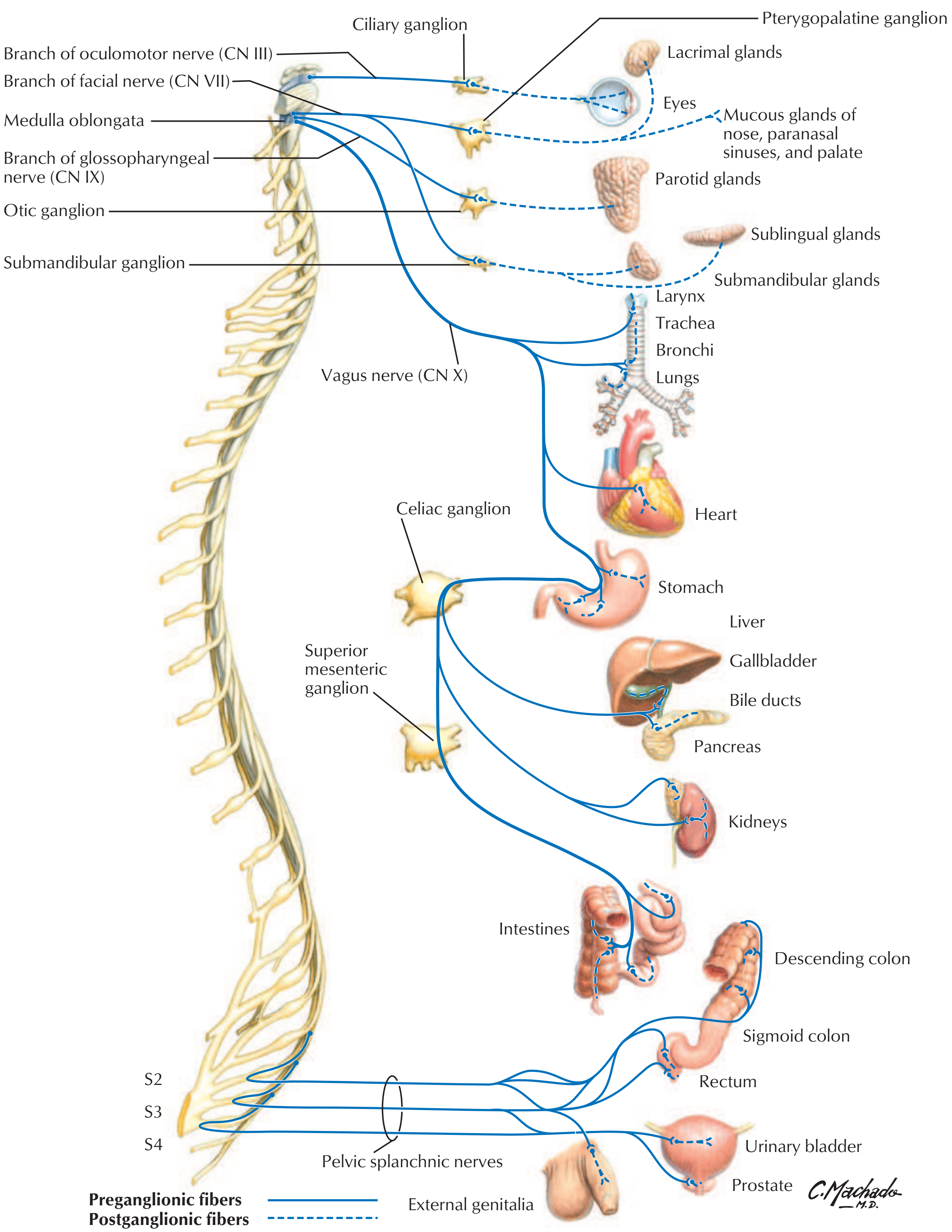
C5	Level of clavicles
C5, 6	Lateral sides of upper limbs
C8, T1	Medial sides of upper limbs
C6	Digit I (thumb)
C6, 7, 8	Hand
C8	Digits IV and V (ring and little fingers)
T4	Level of nipples
T10	Level of umbilicus
L1	Inguinal region
L1, 2, 3, 4	Anterior and medial surfaces of lower limbs
L4, 5, S1	Foot
L4	Medial side digit I (great toe)
L5, S1, 2	Lateral and posterior surfaces of lower limbs
S1	Lateral margin of foot and digit V (little toe)
S2, 3, 4	Perineum

Sympathetic Nervous System: Schema

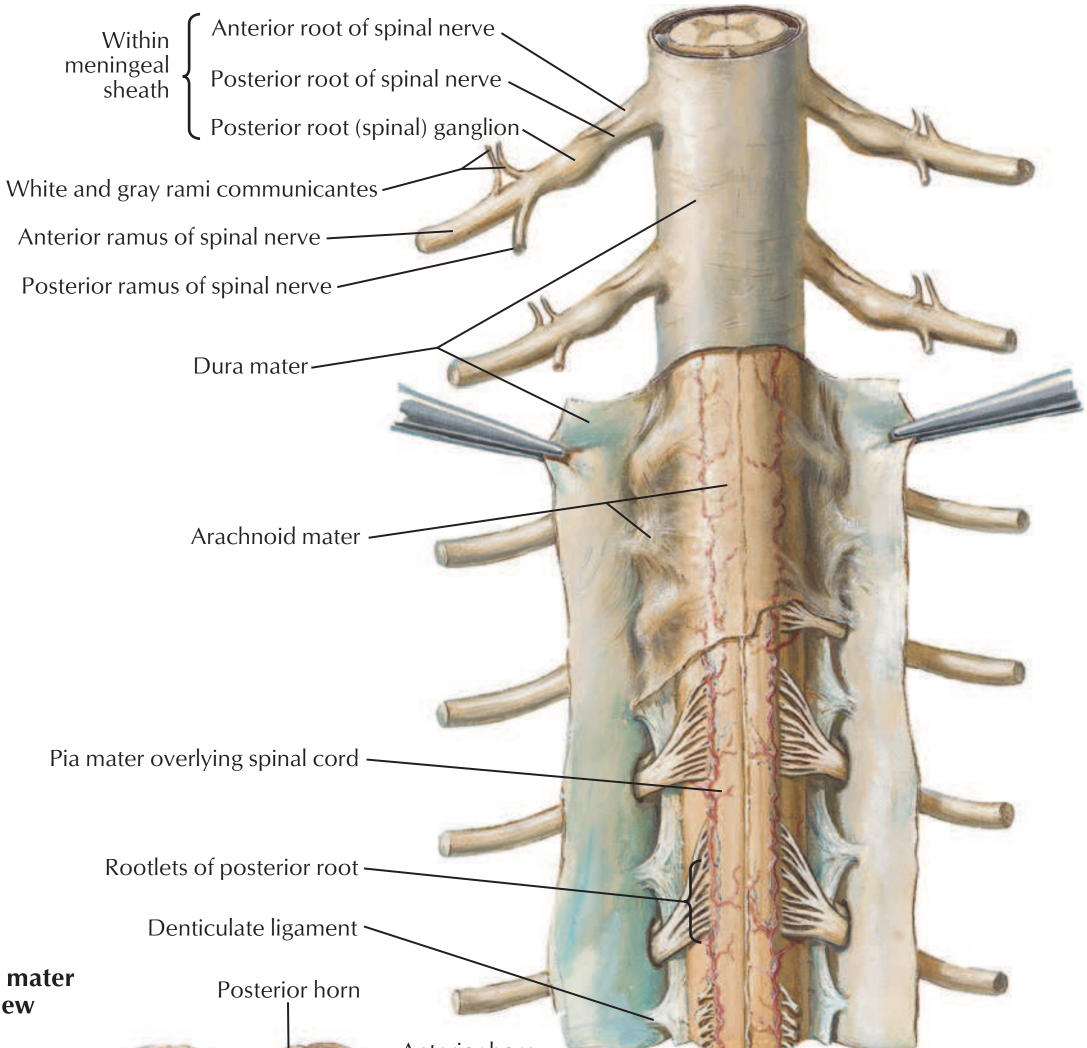
See also Plates 213, 320, 322


Superior cervical ganglion
First thoracic ganglion
Gray rami communicantes
Internal carotid nerve and internal carotid plexus
External carotid nerve and external carotid plexus
Lacrimal gland
Eye
Parotid gland
Sublingual gland
Submandibular gland
Innervation to arrector pili muscles, vascular smooth muscle, and sweat glands of skin
C1– C8
Larynx
Trachea
Bronchi
Lungs
Cardiac branches
Greater splanchnic nerve
Heart
T1– T12
Celiac ganglion
Lesser splanchnic nerve
Stomach
Aorticorenal ganglion
Liver
Gallbladder
Bile ducts
White ramus communicans
Pancreas
Gray ramus communicans
Least splanchnic nerve
Suprarenal gland
Kidneys
Superior mesenteric ganglion
Intestines
Lumbar splanchnic nerves
L1– L5
First lumbar ganglion
Superior hypogastric plexus
Sacral splanchnic nerves
Descending colon
Inferior mesenteric ganglion
Sigmoid colon
First sacral ganglion
S1– S5
Rectum
Inferior hypogastric plexus
Urinary bladder
Prostate
External genitalia
Preganglionic fibers
Postganglionic fibers

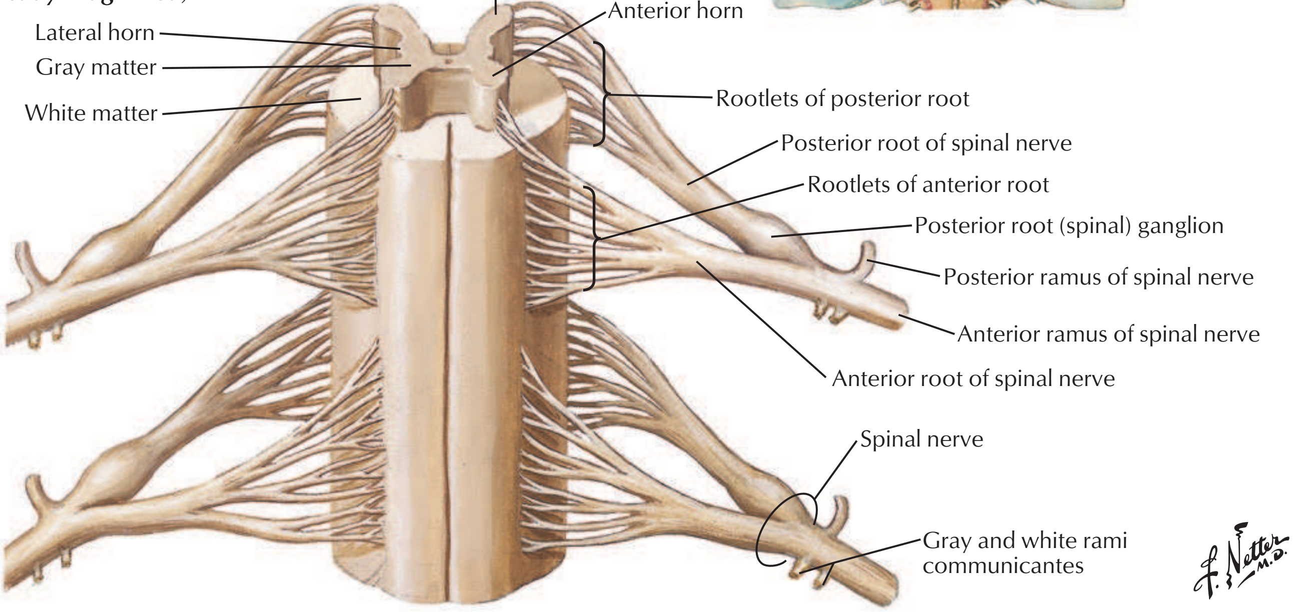
See also Plates 306, 394


Ciliary ganglion
Pterygopalatine ganglion
Branch of oculomotor nerve (CN III)
Lacrimal glands
Branch of facial nerve (CN VII)
Eyes
Medulla oblongata
Mucous glands of nose, paranasal sinuses, and palate
Branch of glossopharyngeal nerve (CN IX)
Parotid glands
Otic ganglion
Sublingual glands
Submandibular ganglion
Submandibular glands
Larynx
Trachea
Bronchi
Vagus nerve (CN X)
Lungs
Celiac ganglion
Heart
Stomach
Liver
Superior mesenteric ganglion
Gallbladder
Bile ducts
Pancreas
Kidneys
Intestines
Descending colon
Sigmoid colon
S2
Rectum
S3
S4
Urinary bladder
Pelvic splanchnic nerves
Prostate
C.Machado M.D.
Preganglionic fibers
Postganglionic fibers
External genitalia

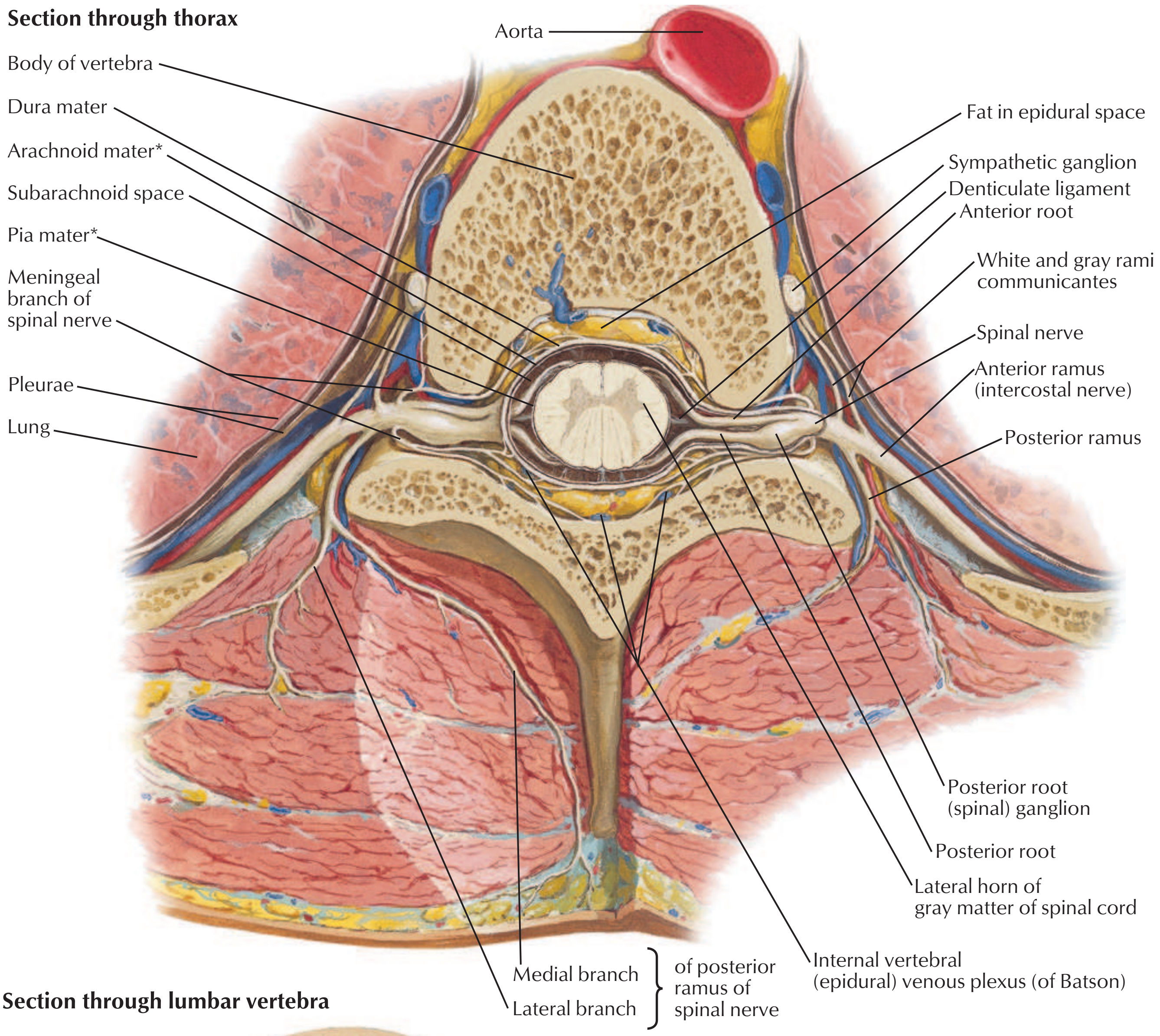
Posterior view


Within meningeal sheath
Anterior root of spinal nerve
Posterior root of spinal nerve
Posterior root (spinal) ganglion
White and gray rami communicantes
Anterior ramus of spinal nerve
Posterior ramus of spinal nerve
Dura mater
Arachnoid mater
Pia mater overlying spinal cord
Rootlets of posterior root
Denticulate ligament

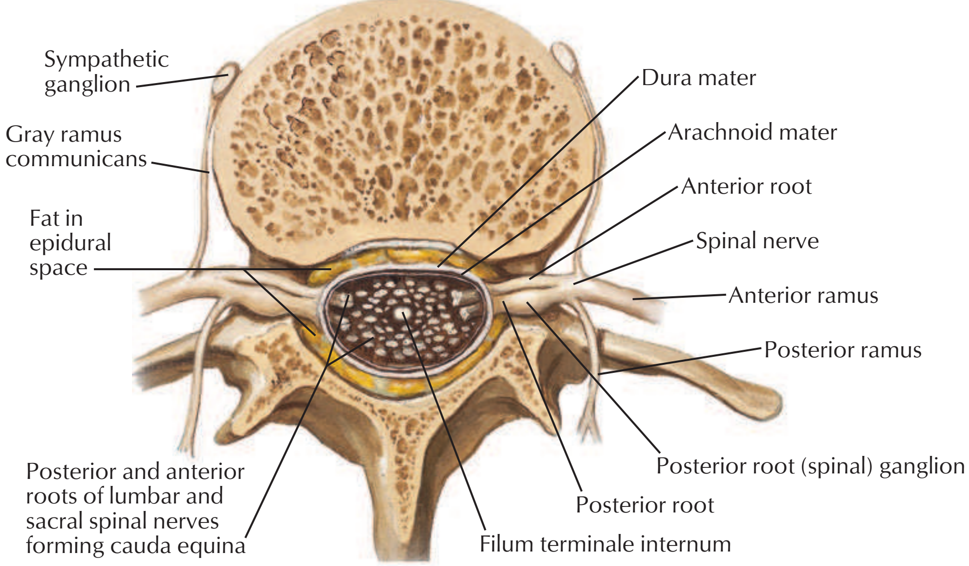
Dura and arachnoid mater removed: anterior view (*greatly magnified*)


Posterior horn
Anterior horn
Lateral horn
Gray matter
White matter
Rootlets of posterior root
Posterior root of spinal nerve
Rootlets of anterior root
Posterior root (spinal) ganglion
Posterior ramus of spinal nerve
Anterior ramus of spinal nerve
Anterior root of spinal nerve
Spinal nerve
Gray and white rami communicantes

Section through thorax

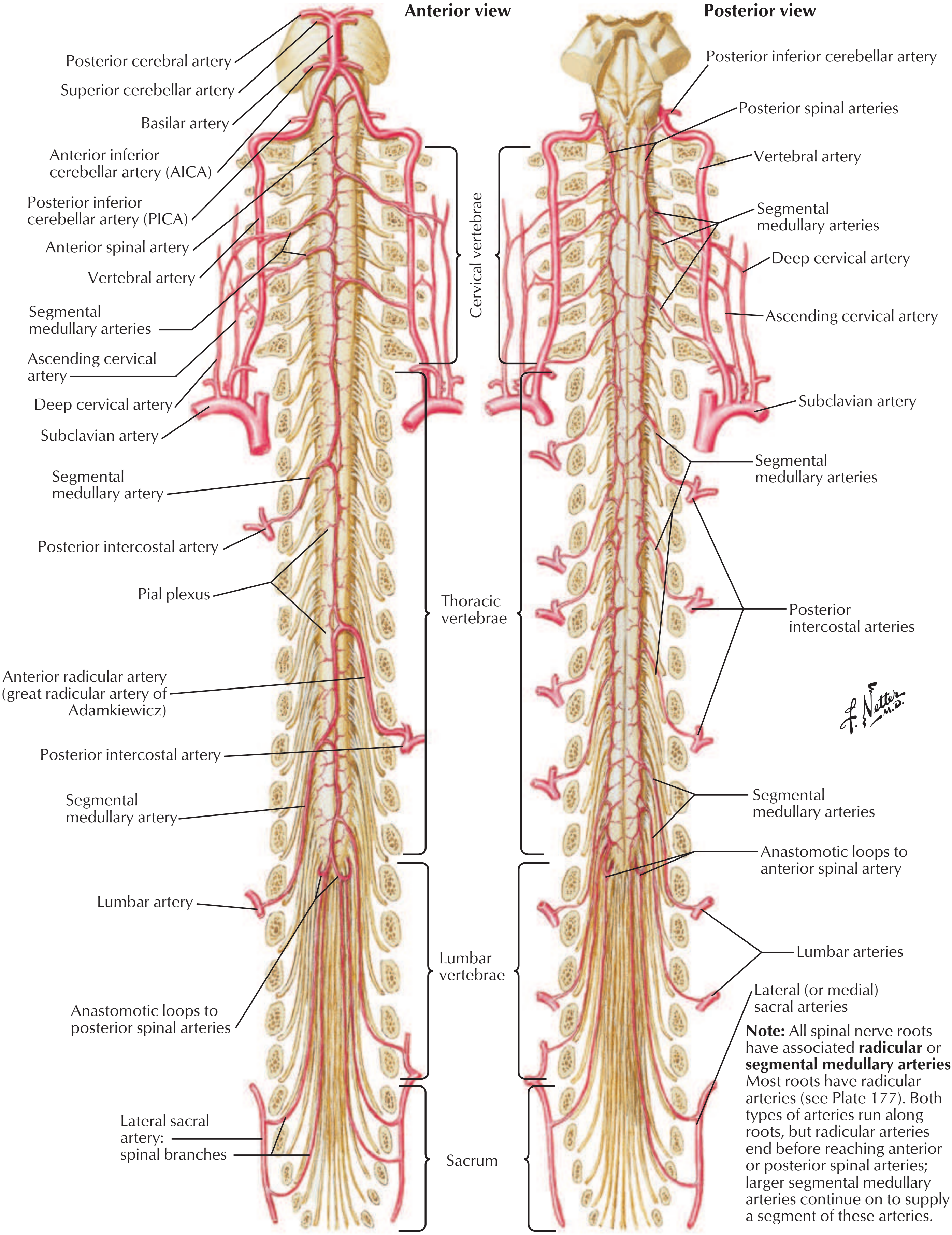

Aorta
Body of vertebra
Dura mater
Arachnoid mater*
Subarachnoid space
Pia mater*
Meningeal branch of spinal nerve
Pleurae
Lung
Fat in epidural space
Sympathetic ganglion
Denticulate ligament
Anterior root
White and gray rami communicantes
Spinal nerve
Anterior ramus (intercostal nerve)
Posterior ramus
Posterior root (spinal) ganglion
Posterior root
Lateral horn of gray matter of spinal cord
Internal vertebral (epidural) venous plexus (of Batson)
Medial branch
Lateral branch
of posterior ramus of spinal nerve

Section through lumbar vertebra


Sympathetic ganglion
Gray ramus communicans
Fat in epidural space
Posterior and anterior roots of lumbar and sacral spinal nerves forming cauda equina
Dura mater
Arachnoid mater
Anterior root
Spinal nerve
Anterior ramus
Posterior ramus
Posterior root (spinal) ganglion
Posterior root
Filum terminale internum

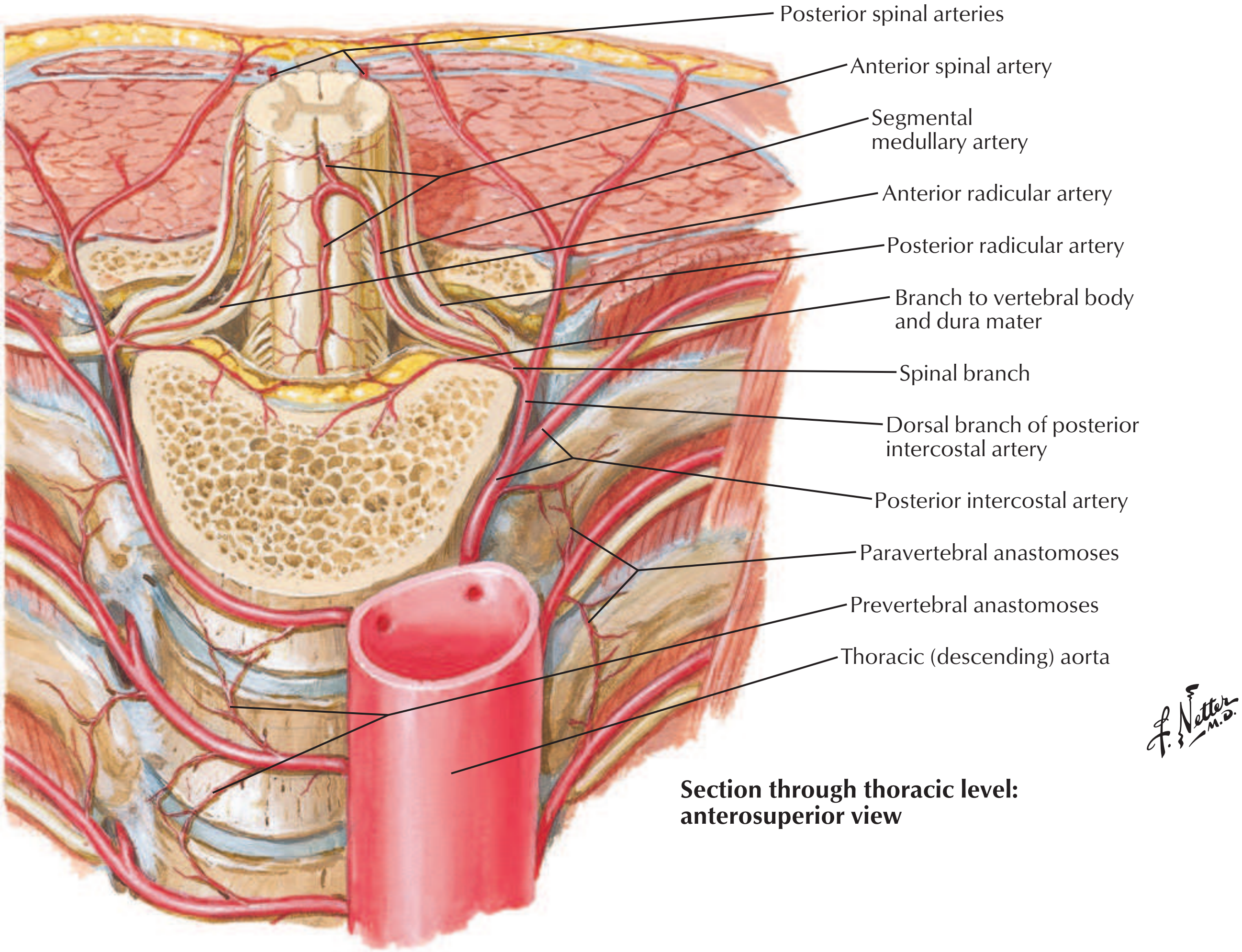
F. Netter M.D.

*Leptomeninges

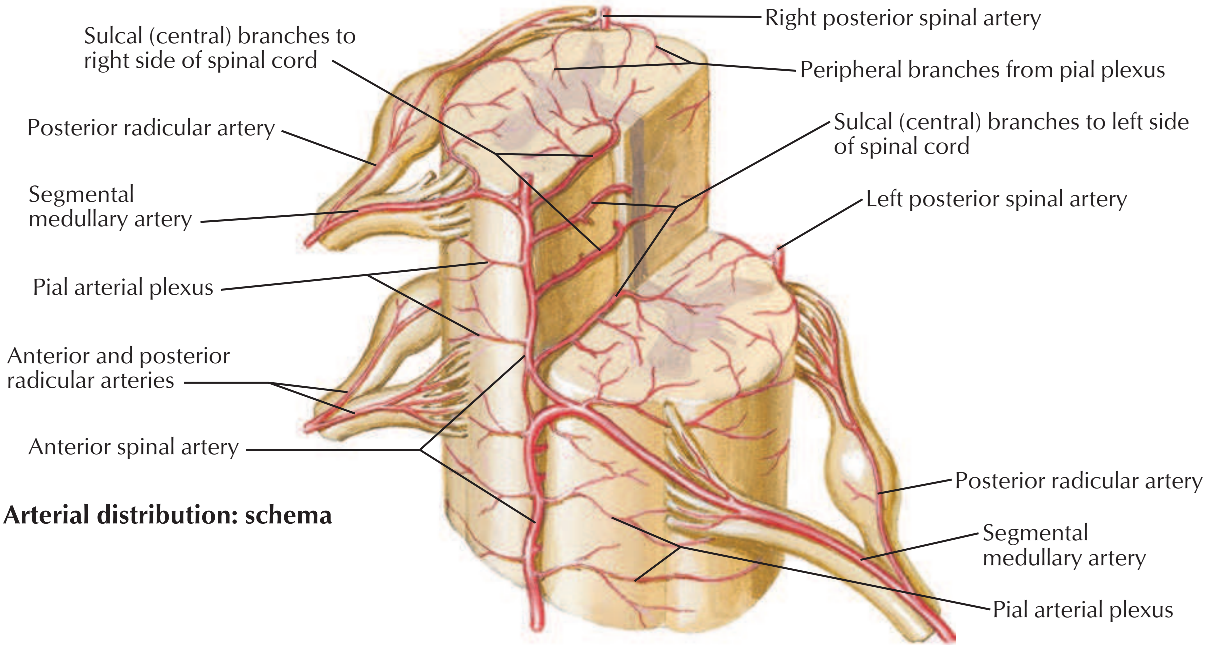

Anterior view
Posterior cerebral artery
Superior cerebellar artery
Basilar artery
Anterior inferior cerebellar artery (AICA)
Posterior inferior cerebellar artery (PICA)
Anterior spinal artery
Vertebral artery
Segmental medullary arteries
Ascending cervical artery
Deep cervical artery
Subclavian artery
Segmental medullary artery
Posterior intercostal artery
Pial plexus
Anterior radicular artery (great radicular artery of Adamkiewicz)
Posterior intercostal artery
Segmental medullary artery
Lumbar artery
Anastomotic loops to posterior spinal arteries
Lateral sacral artery: spinal branches
Cervical vertebrae
Thoracic vertebrae
Lumbar vertebrae
Sacrum
Posterior view
Posterior inferior cerebellar artery
Posterior spinal arteries
Vertebral artery
Segmental medullary arteries
Deep cervical artery
Ascending cervical artery
Subclavian artery
Segmental medullary arteries
Posterior intercostal arteries
Segmental medullary arteries
Anastomotic loops to anterior spinal artery
Lumbar arteries
Lateral (or medial) sacral arteries

Note: All spinal nerve roots have associated **radicular** or **segmental medullary arteries**. Most roots have radicular arteries (see Plate 177). Both types of arteries run along roots, but radicular arteries end before reaching anterior or posterior spinal arteries; larger segmental medullary arteries continue on to supply a segment of these arteries.

Arteries of Spinal Cord: Intrinsic Distribution

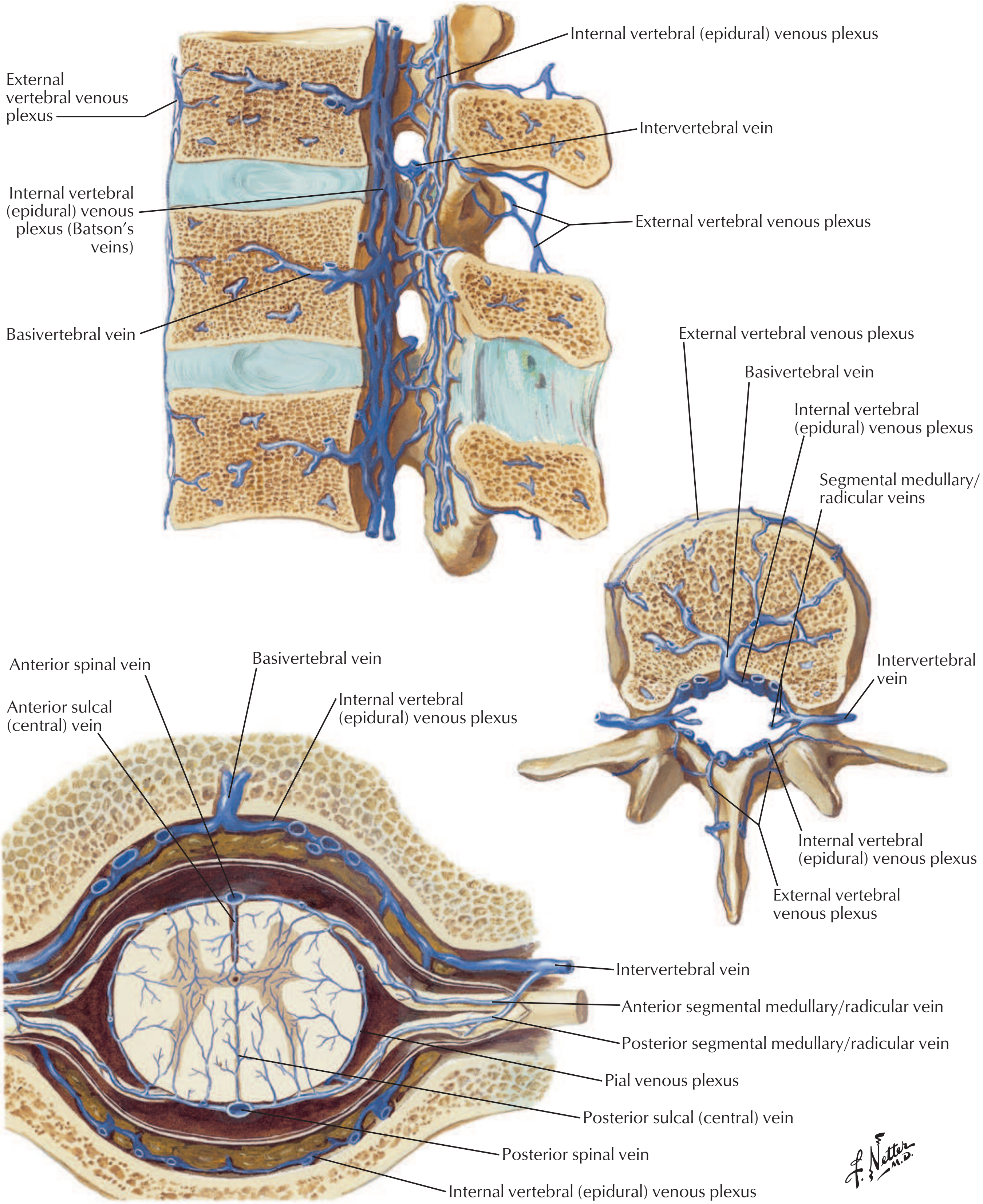

Posterior spinal arteries
Anterior spinal artery
Segmental medullary artery
Anterior radicular artery
Posterior radicular artery
Branch to vertebral body and dura mater
Spinal branch
Dorsal branch of posterior intercostal artery
Posterior intercostal artery
Paravertebral anastomoses
Prevertebral anastomoses
Thoracic (descending) aorta
F. Netter M.D.

Section through thoracic level: anterosuperior view

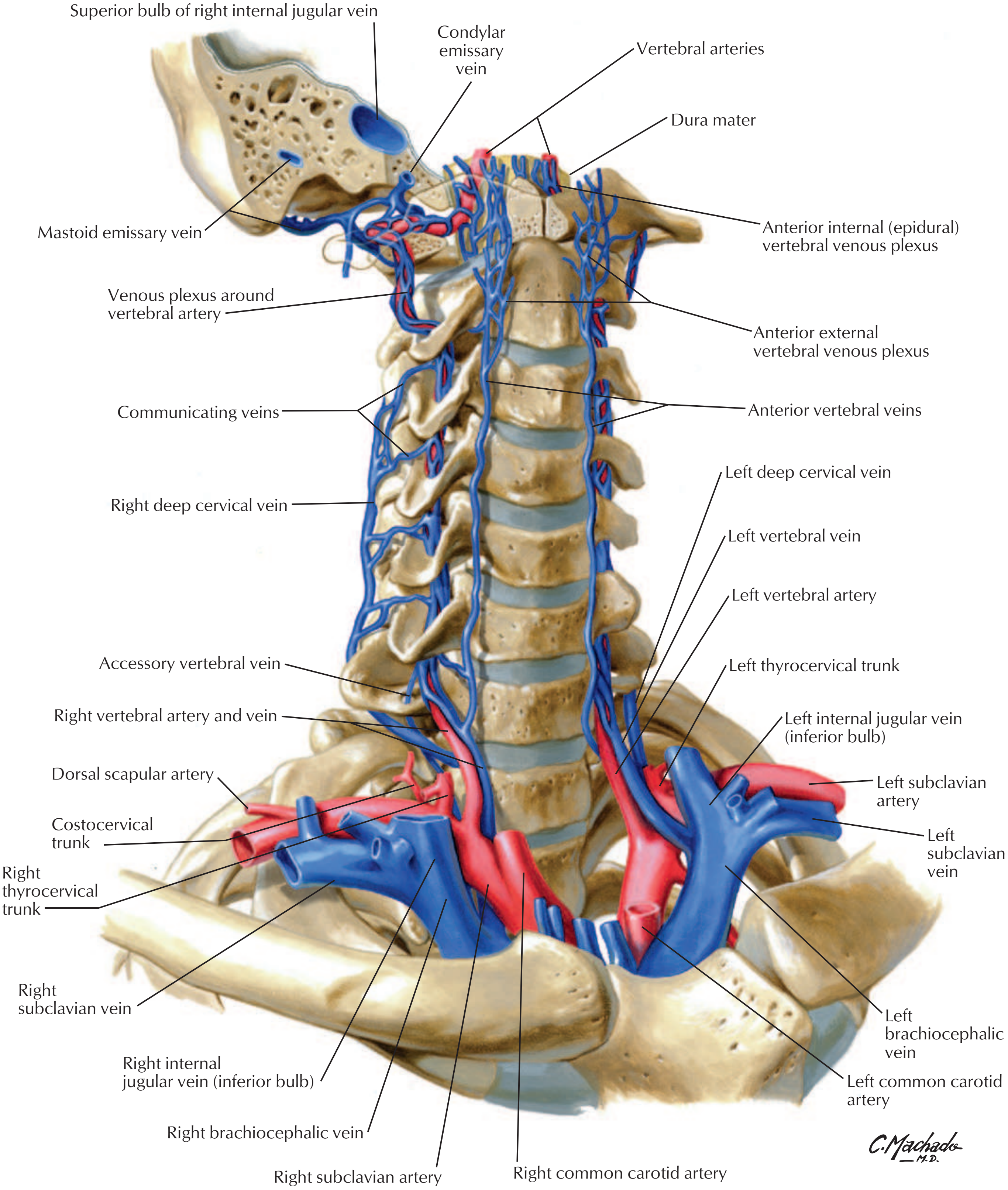

Sulcal (central) branches to right side of spinal cord
Posterior radicular artery
Segmental medullary artery
Pial arterial plexus
Anterior and posterior radicular arteries
Anterior spinal artery
Right posterior spinal artery
Peripheral branches from pial plexus
Sulcal (central) branches to left side of spinal cord
Left posterior spinal artery
Posterior radicular artery
Segmental medullary artery
Pial arterial plexus

Arterial distribution: schema

Veins of Spinal Cord and Vertebral Column

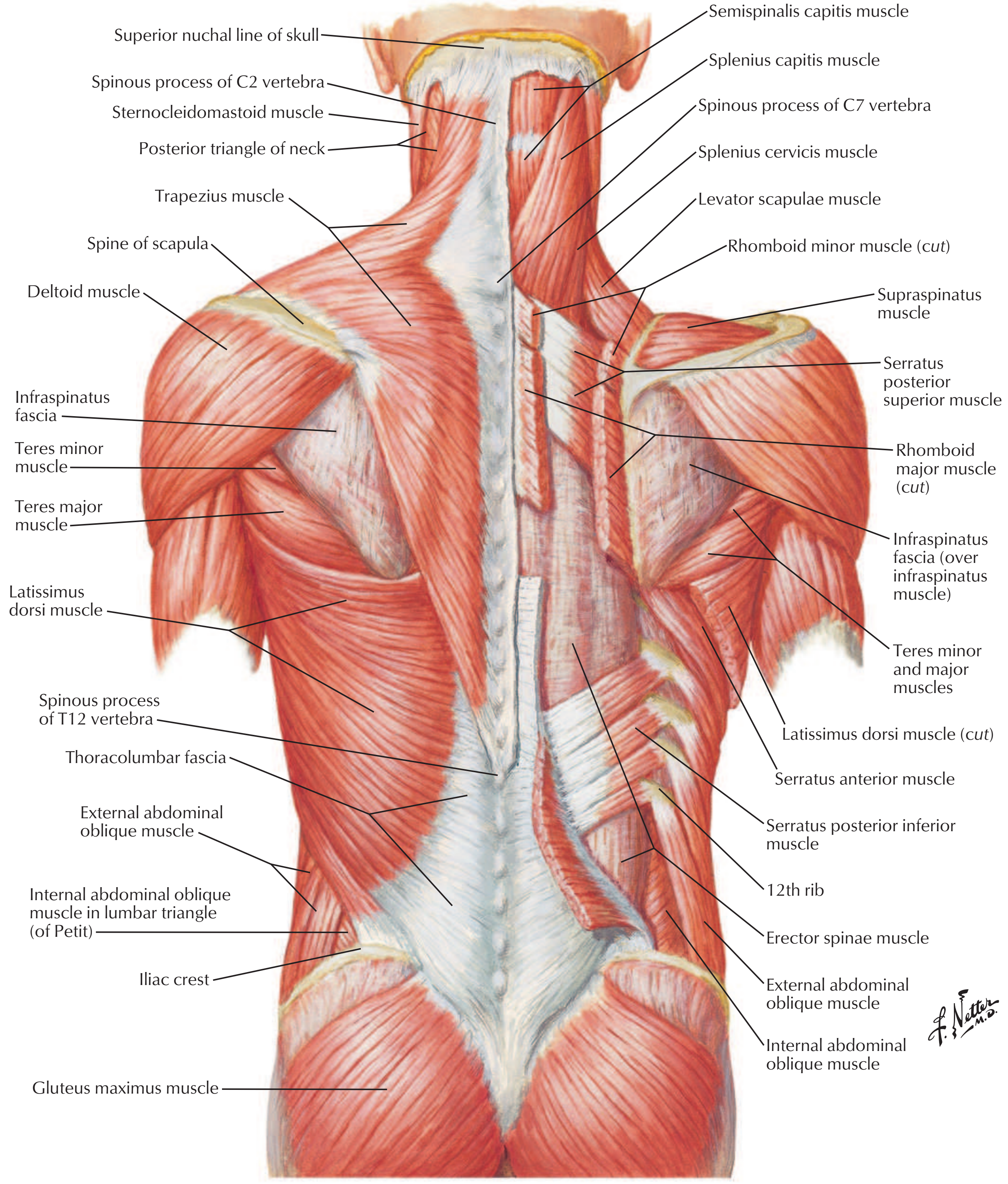


Internal vertebral (epidural) venous plexus
External vertebral venous plexus
Intervertebral vein
Internal vertebral (epidural) venous plexus (Batson's veins)
External vertebral venous plexus
Basivertebral vein
External vertebral venous plexus
Basivertebral vein
Internal vertebral (epidural) venous plexus
Segmental medullary/ radicular veins
Intervertebral vein
Internal vertebral (epidural) venous plexus
External vertebral venous plexus
Anterior spinal vein
Basivertebral vein
Anterior sulcal (central) vein
Internal vertebral (epidural) venous plexus
Intervertebral vein
Anterior segmental medullary/radicular vein
Posterior segmental medullary/radicular vein
Pial venous plexus
Posterior sulcal (central) vein
Posterior spinal vein
Internal vertebral (epidural) venous plexus

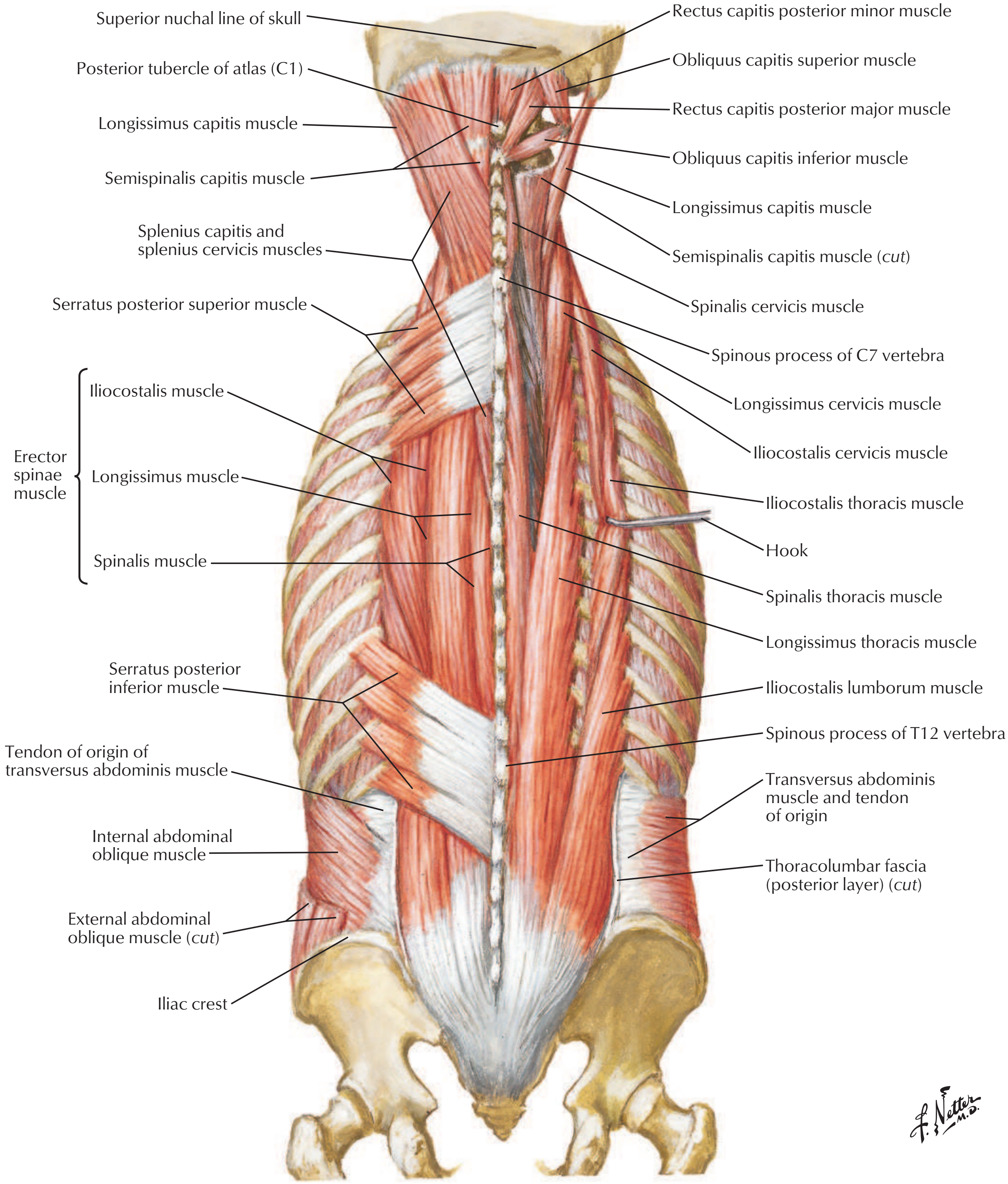

Superior bulb of right internal jugular vein
Condylar emissary vein
Vertebral arteries
Dura mater
Mastoid emissary vein
Anterior internal (epidural) vertebral venous plexus
Venous plexus around vertebral artery
Anterior external vertebral venous plexus
Communicating veins
Anterior vertebral veins
Left deep cervical vein
Right deep cervical vein
Left vertebral vein
Left vertebral artery
Left thyrocervical trunk
Accessory vertebral vein
Right vertebral artery and vein
Left internal jugular vein (inferior bulb)
Dorsal scapular artery
Left subclavian artery
Costocervical trunk
Left subclavian vein
Right thyrocervical trunk
Right subclavian vein
Left brachiocephalic vein
Right internal jugular vein (inferior bulb)
Left common carotid artery
Right brachiocephalic vein
Right subclavian artery
Right common carotid artery
C. Machado M.D.

Muscles of Back: Superficial Layer

See also Plates 36, 257



Superior nuchal line of skull
Spinous process of C2 vertebra
Sternocleidomastoid muscle
Posterior triangle of neck
Trapezius muscle
Spine of scapula
Deltoid muscle
Infraspinatus fascia
Teres minor muscle
Teres major muscle
Latissimus dorsi muscle
Spinous process of T12 vertebra
Thoracolumbar fascia
External abdominal oblique muscle
Internal abdominal oblique muscle in lumbar triangle (of Petit)
Iliac crest
Gluteus maximus muscle
Semispinalis capitis muscle
Splenius capitis muscle
Spinous process of C7 vertebra
Splenius cervicis muscle
Levator scapulae muscle
Rhomboid minor muscle (cut)
Supraspinatus muscle
Serratus posterior superior muscle
Rhomboid major muscle (cut)
Infraspinatus fascia (over infraspinatus muscle)
Teres minor and major muscles
Latissimus dorsi muscle (cut)
Serratus anterior muscle
Serratus posterior inferior muscle
12th rib
Erector spinae muscle
External abdominal oblique muscle
Internal abdominal oblique muscle
F. Netter M.D.


Superior nuchal line of skull
Posterior tubercle of atlas (C1)
Longissimus capitis muscle
Semispinalis capitis muscle
Splenius capitis and splenius cervicis muscles
Serratus posterior superior muscle
Erector spinae muscle
Iliocostalis muscle
Longissimus muscle
Spinalis muscle
Serratus posterior inferior muscle
Tendon of origin of transversus abdominis muscle
Internal abdominal oblique muscle
External abdominal oblique muscle (*cut*)
Iliac crest
Rectus capitis posterior minor muscle
Obliquus capitis superior muscle
Rectus capitis posterior major muscle
Obliquus capitis inferior muscle
Longissimus capitis muscle
Semispinalis capitis muscle (*cut*)
Spinalis cervicis muscle
Spinous process of C7 vertebra
Longissimus cervicis muscle
Iliocostalis cervicis muscle
Iliocostalis thoracis muscle
Hook
Spinalis thoracis muscle
Longissimus thoracis muscle
Iliocostalis lumborum muscle
Spinous process of T12 vertebra
Transversus abdominis muscle and tendon of origin
Thoracolumbar fascia (posterior layer) (*cut*)
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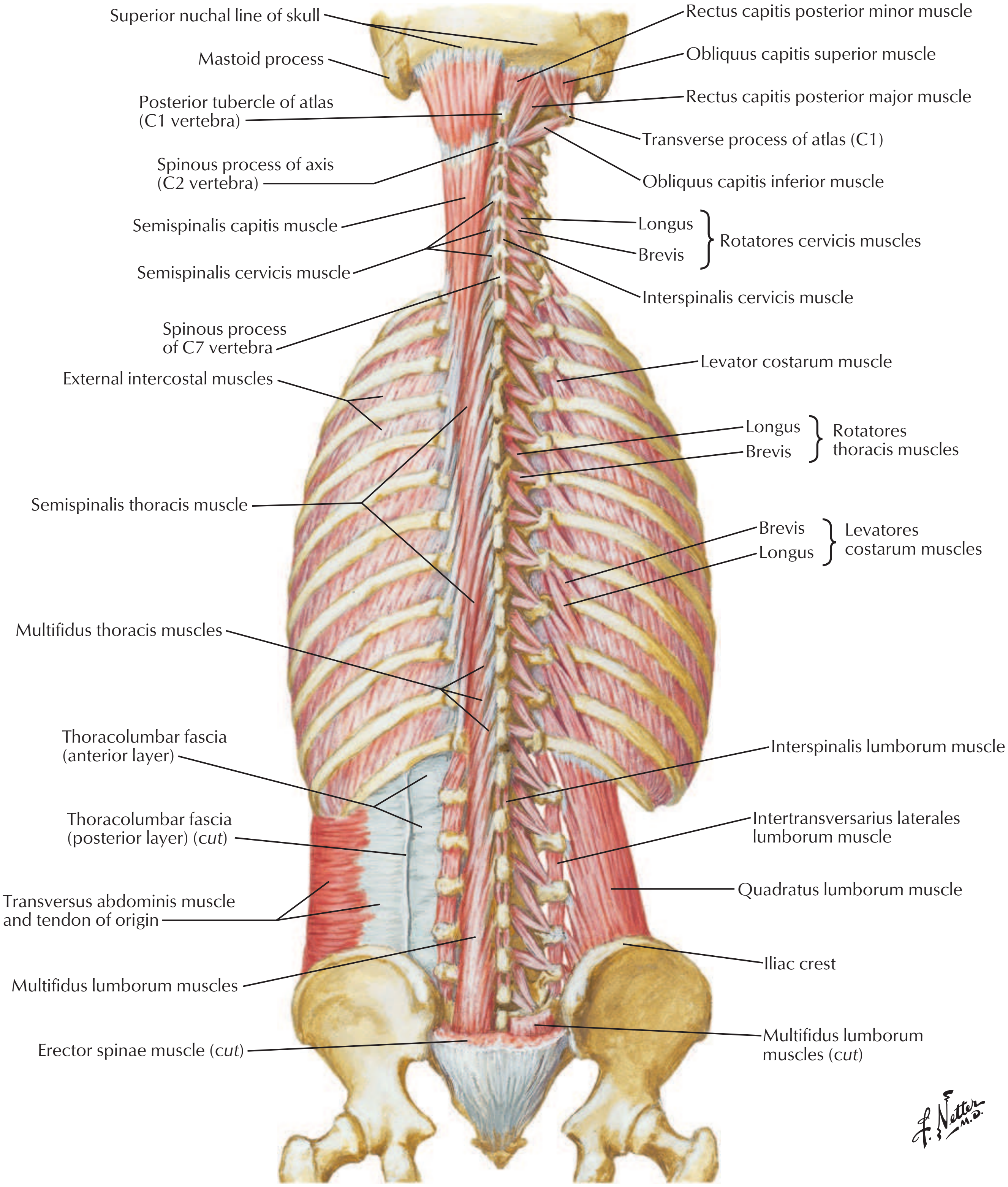
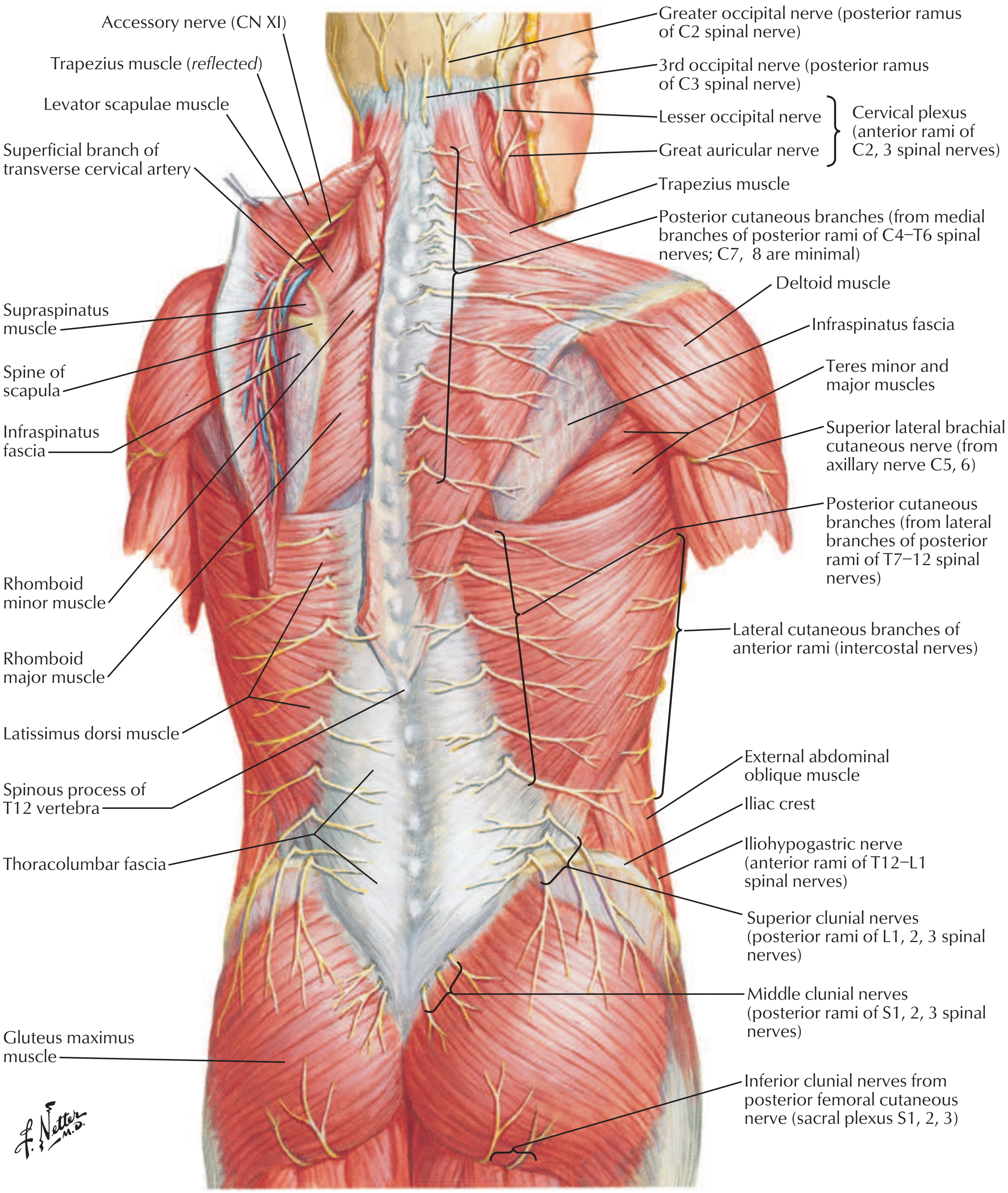
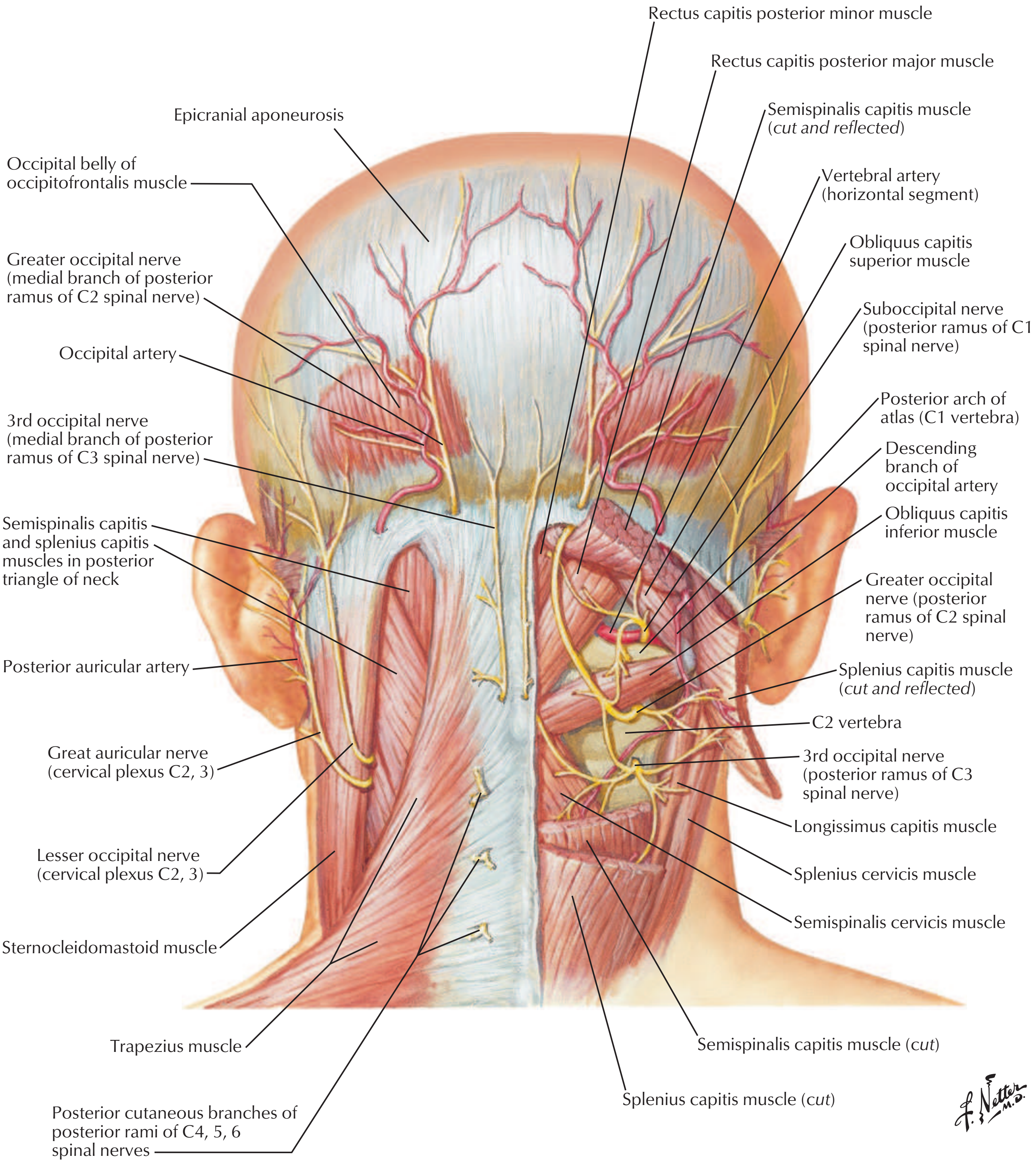

Superior nuchal line of skull
Mastoid process
Posterior tubercle of atlas (C1 vertebra)
Spinous process of axis (C2 vertebra)
Semispinalis capitis muscle
Semispinalis cervicis muscle
Spinous process of C7 vertebra
External intercostal muscles
Semispinalis thoracis muscle
Multifidus thoracis muscles
Thoracolumbar fascia (anterior layer)
Thoracolumbar fascia (posterior layer) (*cut*)
Transversus abdominis muscle and tendon of origin
Multifidus lumborum muscles
Erector spinae muscle (*cut*)
Rectus capitis posterior minor muscle
Obliquus capitis superior muscle
Rectus capitis posterior major muscle
Transverse process of atlas (C1)
Obliquus capitis inferior muscle
Longus
Brevis
Rotatores cervicis muscles
Interspinalis cervicis muscle
Levator costarum muscle
Longus
Brevis
Rotatores thoracis muscles
Brevis
Longus
Levatores costarum muscles
Interspinalis lumborum muscle
Intertransversarius laterales lumborum muscle
Quadratus lumborum muscle
Iliac crest
Multifidus lumborum muscles (*cut*)


Accessory nerve (CN XI)
Trapezius muscle (*reflected*)
Levator scapulae muscle
Superficial branch of transverse cervical artery
Supraspinatus muscle
Spine of scapula
Infraspinatus fascia
Rhomboid minor muscle
Rhomboid major muscle
Latissimus dorsi muscle
Spinous process of T12 vertebra
Thoracolumbar fascia
Gluteus maximus muscle
Greater occipital nerve (posterior ramus of C2 spinal nerve)
3rd occipital nerve (posterior ramus of C3 spinal nerve)
Lesser occipital nerve
Great auricular nerve
Cervical plexus (anterior rami of C2, 3 spinal nerves)
Trapezius muscle
Posterior cutaneous branches (from medial branches of posterior rami of C4–T6 spinal nerves; C7, 8 are minimal)
Deltoid muscle
Infraspinatus fascia
Teres minor and major muscles
Superior lateral brachial cutaneous nerve (from axillary nerve C5, 6)
Posterior cutaneous branches (from lateral branches of posterior rami of T7–12 spinal nerves)
Lateral cutaneous branches of anterior rami (intercostal nerves)
External abdominal oblique muscle
Iliac crest
Iliohypogastric nerve (anterior rami of T12–L1 spinal nerves)
Superior clunial nerves (posterior rami of L1, 2, 3 spinal nerves)
Middle clunial nerves (posterior rami of S1, 2, 3 spinal nerves)
Inferior clunial nerves from posterior femoral cutaneous nerve (sacral plexus S1, 2, 3)
F. Netter M.D.

Suboccipital Triangle

See also Plates 36, 39


Rectus capitis posterior minor muscle
Rectus capitis posterior major muscle
Epicranial aponeurosis
Semispinalis capitis muscle (*cut and reflected*)
Occipital belly of occipitofrontalis muscle
Vertebral artery (horizontal segment)
Obliquus capitis superior muscle
Greater occipital nerve (medial branch of posterior ramus of C2 spinal nerve)
Suboccipital nerve (posterior ramus of C1 spinal nerve)
Occipital artery
Posterior arch of atlas (C1 vertebra)
3rd occipital nerve (medial branch of posterior ramus of C3 spinal nerve)
Descending branch of occipital artery
Semispinalis capitis and splenius capitis muscles in posterior triangle of neck
Obliquus capitis inferior muscle
Greater occipital nerve (posterior ramus of C2 spinal nerve)
Posterior auricular artery
Splenius capitis muscle (*cut and reflected*)
C2 vertebra
Great auricular nerve (cervical plexus C2, 3)
3rd occipital nerve (posterior ramus of C3 spinal nerve)
Longissimus capitis muscle
Lesser occipital nerve (cervical plexus C2, 3)
Splenius cervicis muscle
Semispinalis cervicis muscle
Sternocleidomastoid muscle
Trapezius muscle
Semispinalis capitis muscle (*cut*)
Splenius capitis muscle (*cut*)
Posterior cutaneous branches of posterior rami of C4, 5, 6 spinal nerves
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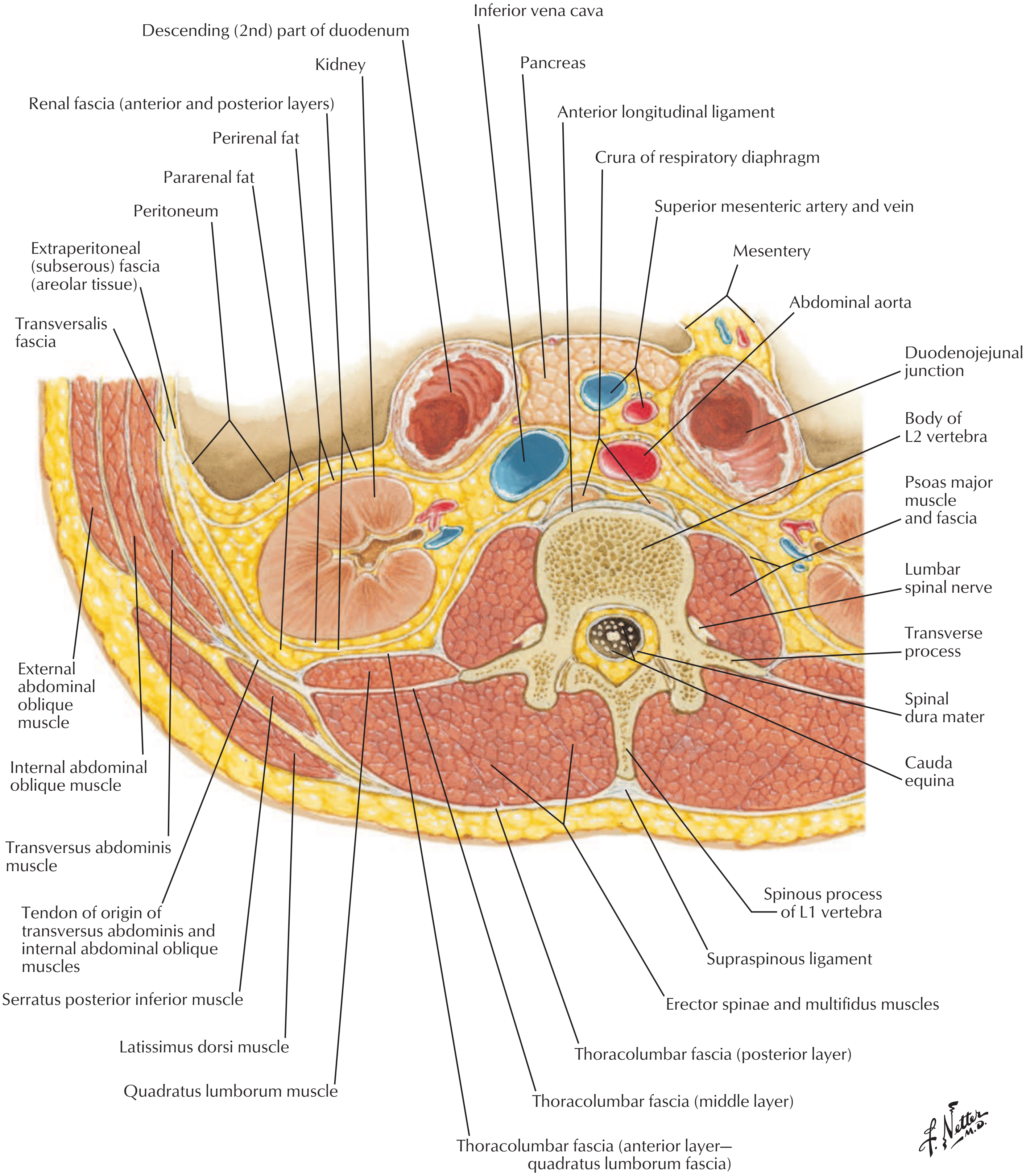
Lumbar Region of Back: Cross Section

See also Plates 312, 318


Inferior vena cava
Descending (2nd) part of duodenum
Kidney
Pancreas
Renal fascia (anterior and posterior layers)
Anterior longitudinal ligament
Perirenal fat
Crura of respiratory diaphragm
Pararenal fat
Superior mesenteric artery and vein
Peritoneum
Mesentery
Extraperitoneal (subserous) fascia (areolar tissue)
Abdominal aorta
Transversalis fascia
Duodenojejunal junction
Body of L2 vertebra
Psoas major muscle and fascia
Lumbar spinal nerve
Transverse process
External abdominal oblique muscle
Spinal dura mater
Cauda equina
Internal abdominal oblique muscle
Transversus abdominis muscle
Spinous process of L1 vertebra
Tendon of origin of transversus abdominis and internal abdominal oblique muscles
Supraspinous ligament
Serratus posterior inferior muscle
Erector spinae and multifidus muscles
Latissimus dorsi muscle
Thoracolumbar fascia (posterior layer)
Quadratus lumborum muscle
Thoracolumbar fascia (middle layer)
Thoracolumbar fascia (anterior layer—quadratus lumborum fascia)
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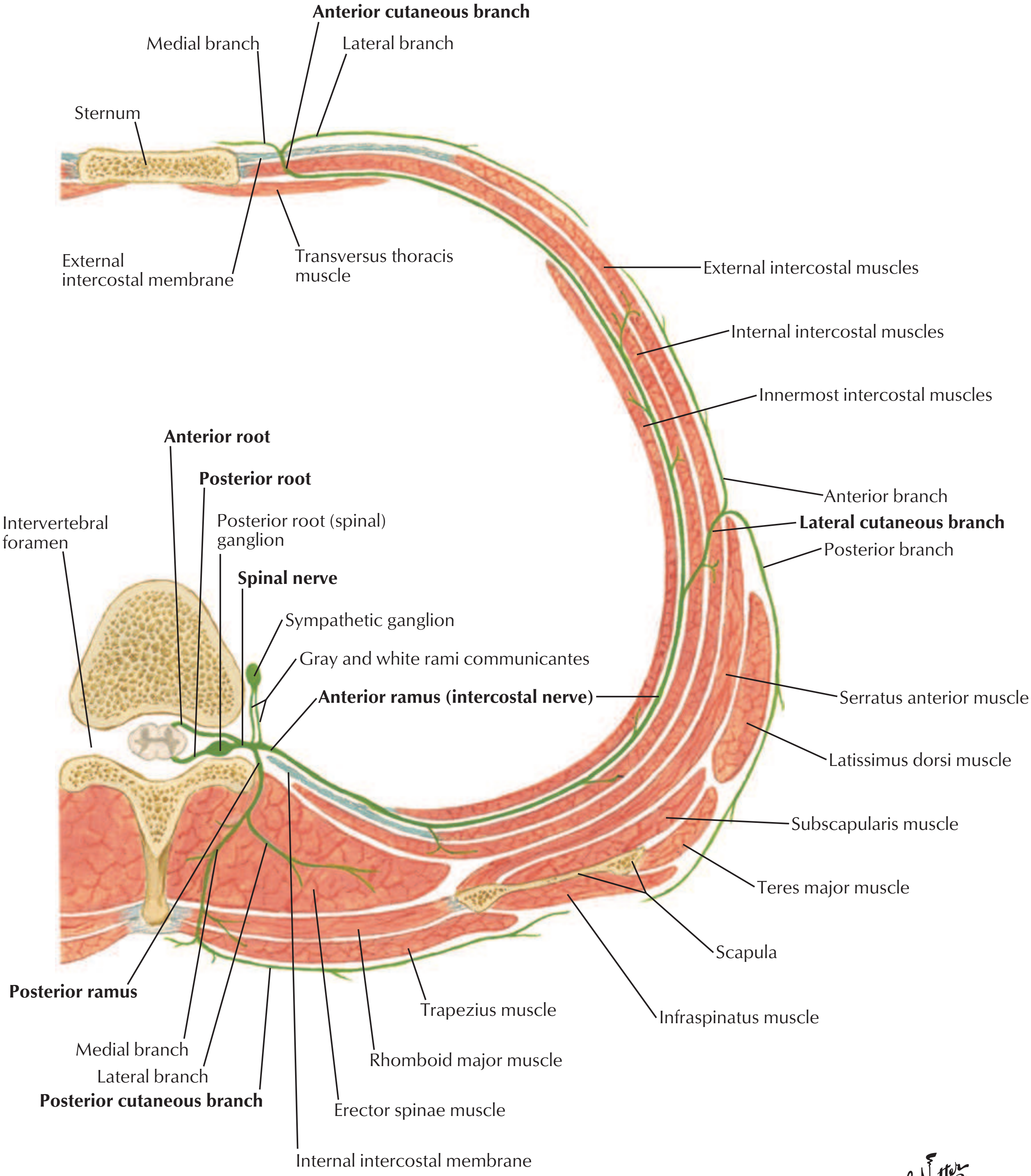
Typical Thoracic Spinal Nerve: Cross Section

See also Plate 261



Anterior cutaneous branch
Medial branch
Lateral branch
Sternum
External intercostal membrane
Transversus thoracis muscle
External intercostal muscles
Internal intercostal muscles
Innermost intercostal muscles
Anterior root
Posterior root
Intervertebral foramen
Posterior root (spinal) ganglion
Spinal nerve
Anterior branch
Lateral cutaneous branch
Posterior branch
Sympathetic ganglion
Gray and white rami communicantes
Anterior ramus (intercostal nerve)
Serratus anterior muscle
Latissimus dorsi muscle
Subscapularis muscle
Teres major muscle
Scapula
Posterior ramus
Trapezius muscle
Infraspinatus muscle
Medial branch
Rhomboid major muscle
Lateral branch
Posterior cutaneous branch
Erector spinae muscle
Internal intercostal membrane

Note: *In lower thoracic region, lateral branch of posterior ramus is longer, motor, and cutaneous; medial branch is shorter and motor only.*

ANATOMIC STRUCTURES	CLINICAL IMPORTANCE	PLATE NUMBERS
SKELETAL SYSTEM		
Spinous processes	Palpable landmarks used to assess spinal curvatures and determine location of spinal cord for procedures such as lumbar puncture and injection of spinal anesthesia	161, 180
C7 spinous process	Most prominent spinous process (vertebra prominens); often used to begin counting vertebrae	161, 163
Intervertebral disc	Age-related changes may produce herniation of nucleus pulposus, causing back pain; occurs most commonly in lower lumbar regions of vertebral column	164, 170
Lamina	Surgically removed in laminectomy to gain access to vertebral canal and spinal cord	164
Intervertebral foramen	May become narrowed by age-related changes (e.g., osteophyte formation) or changes in intervertebral disc height, producing compression of its contents	164, 167, 168
Sacral hiatus	Provides access to epidural space to administer caudal epidural anesthesia	166
5th lumbar vertebra	Spondylolysis is clinical condition in which vertebral body separates from the part of its vertebral arch bearing inferior articulating process; if this occurs bilaterally, L5 body and transverse process may slide forward over sacrum, giving rise to spondylolisthesis	167
L5/S1 vertebrae	Most common level of intervertebral disc herniation	167, 170
Vertebral foramen	May become narrowed by arthritic changes in lumbar vertebrae, resulting in spinal stenosis; can lead to back pain, sciatica, numbness or tingling, and weakness in lower limbs	163, 164
MUSCULAR SYSTEM		
Trapezius muscle	Responsible for holding scapula against thoracic wall against gravity; drooping of shoulder indicates weakness of or injury to accessory nerve	180
Intrinsic back muscles	Microscopic stretching or tearing of muscle fibers produces back strain, a common cause of low back pain	181, 182
NERVOUS SYSTEM		
Conus medullaris	Indicates inferior limit of spinal cord; it is necessary to locate this point in procedures such as lumbar puncture	169
Cauda equina	Lumbar and sacral nerve roots may be anesthetized with anesthesia injected into subarachnoid space (spinal block)	169, 170
Spinal meninges	Access to epidural and subarachnoid spaces is necessary for clinical procedures such as epidural anesthesia and lumbar puncture	165, 175
CARDIOVASCULAR SYSTEM		
Segmental medullary arteries	Narrowing or damage to these arteries caused by atherosclerosis, vertebral fractures, or vertebral dislocations may cause ischemia of spinal cord	176
Vertebral venous plexuses	Venous conduits for metastasis of cancer cells to spine, lungs, and brain	178

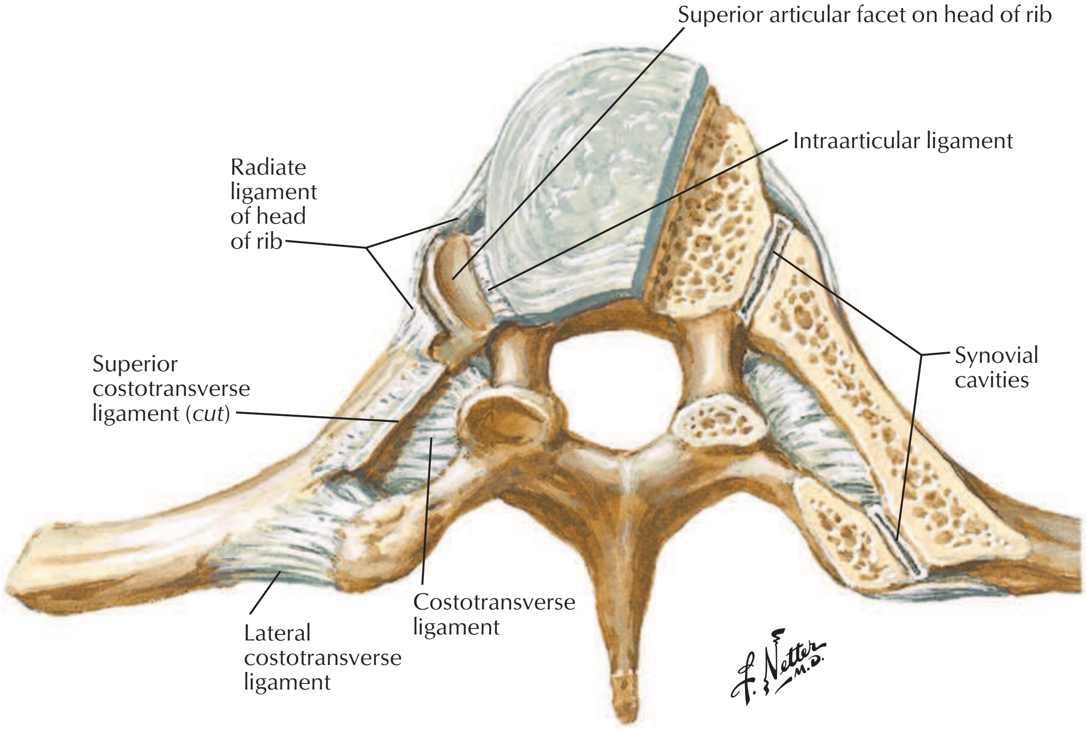
*Selections were based largely on clinical data as well as commonly covered clinical correlations in gross anatomy courses.

MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Erector spinae	Sacrospinalis	Posterior sacrum, iliac crest, sacrospinous ligament, supraspinous ligament, spinous processes of lower lumbar vertebrae and sacrum	*Iliocostalis:* angles of lower ribs, cervical transverse processes *Longissimus:* between tubercles and angles of ribs, transverse processes of thoracic and cervical vertebrae, mastoid process *Spinalis:* spinous processes of upper thoracic and midcervical vertebrae	Posterior rami of each region	*Cervical portions:* occipital, deep cervical, and vertebral arteries *Thoracic portions:* dorsal branches of posterior intercostal, subcostal, and lumbar arteries *Sacral portions:* dorsal branches of lateral sacral arteries	Extends and laterally bends vertebral column and head
Interspinales (cervical, thoracic, lumbar)	Segmental	Spinous process	Adjacent spinous process	Posterior rami of spinal nerves	*Cervical portions:* occipital, deep cervical, and vertebral arteries *Thoracic portions:* dorsal branches of posterior intercostal arteries *Lumbar portions:* dorsal branches of lumbar arteries	Aid in extension of vertebral column
Intertransversarii (cervical, thoracic, lumbar)	Segmental	Extend between adjacent transverse processes of vertebrae	Extend between adjacent transverse processes of vertebrae	Posterior rami of spinal nerves	*Cervical portions:* occipital, deep cervical, and vertebral arteries *Thoracic portions:* dorsal branches of posterior intercostal, subcostal, and lumbar arteries *Lumbar portions:* dorsal branches of lateral lumbar arteries	Assist in lateral flexion of vertebral column
Latissimus dorsi	Superficial back	Spinous processes of T7–L5, thoracolumbar fascia, iliac crest, and last three ribs	Intertubercular sulcus of humerus	Thoracodorsal nerve	Thoracodorsal artery, dorsal perforating branches of 9th, 10th, and 11th posterior intercostal, subcostal, and first three lumbar arteries	Extends, adducts, and medially rotates humerus
Levator scapulae	Superficial back	Posterior tubercles of transverse processes of C1–C4	Medial border of scapula from superior angle to spine	Anterior rami of C3–C4 and dorsal scapular nerve	Dorsal scapular artery, transverse cervical artery, ascending cervical artery	Elevates scapula medially, inferiorly rotates glenoid fossa
Multifidus	Transversospinales	Sacrum, ilium, transverse processes of T1–T12, and articular processes of C4–C7	Spinous processes of vertebrae above, spanning two to four segments	Posterior rami of each region	*Cervical portions:* occipital, deep cervical, and vertebral arteries *Thoracic portions:* dorsal branches of posterior intercostal, subcostal, and lumbar arteries *Sacral portions:* dorsal branches of lateral sacral arteries	Stabilizes spine
Obliquus capitis inferior	Suboccipital	Spine of axis	Transverse process of atlas	Suboccipital nerve	Vertebral artery, descending branch of occipital artery	Rotates atlas to turn face to same side
Obliquus capitis superior	Suboccipital	Transverse process of atlas	Occipital bone	Suboccipital nerve	Vertebral artery, descending branch of occipital artery	Extends and bends head laterally
Rectus capitis posterior major	Suboccipital	Spine of axis	Inferior nuchal line	Suboccipital nerve	Vertebral artery, descending branch of occipital artery	Extends and rotates head to same side

Variations in spinal nerve contributions to the innervation of muscles, their arterial supply, their attachments, and their actions are common themes in human anatomy. Therefore, expect differences between texts and realize that anatomical variation is normal.

MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Rectus capitis posterior minor	Suboccipital	Tubercle of posterior arch of atlas	Median inferior nuchal line	Suboccipital nerve	Vertebral artery, descending branch of occipital artery	Extends head
Rhomboid major	Superficial back	Spinous processes of T2–T5 vertebrae	Medial border of scapula below base of spine of scapula	Dorsal scapular nerve	Dorsal scapular *OR* deep branch of transverse cervical artery, dorsal perforating branches of upper five or six posterior intercostal arteries	Fixes scapula to thoracic wall and retracts and rotates it to depress glenoid cavity
Rhomboid minor	Superficial back	Nuchal ligament, spines of C7 and T1 vertebrae	Medial border of scapula at spine of scapula	Dorsal scapular nerve	Dorsal scapular *OR* deep branch of transverse cervical artery, dorsal perforating branches of upper five or six posterior intercostal arteries	Fixes scapula to thoracic wall and retracts and rotates it to depress glenoid cavity
Rotatores	Transversospinales	Transverse processes of cervical, thoracic, and lumbar regions	Lamina and transverse process of spine above, spanning one or two segments	Posterior rami of spinal nerves	Dorsal branches of segmental arteries	Stabilizes, extends, and rotates spine
Semispinalis	Transversospinales	Transverse processes of C4–T12	Spinous processes of cervical and thoracic regions	Posterior rami of spinal nerves	*Cervical portions:* occipital, deep cervical, and vertebral arteries *Thoracic portions:* dorsal branches of posterior intercostal arteries	Extends head, neck, and thorax and rotates them to opposite side
Serratus posterior inferior	Intermediate back	Spinous processes of T11–L2	Inferior aspect of ribs 9–12	Anterior rami of lower thoracic nerves	Posterior intercostal arteries	Depresses ribs
Serratus posterior superior	Intermediate back	Nuchal ligament, spinous processes of C7–T3	Superior aspect of ribs 2–5	Anterior rami of upper thoracic nerves	Posterior intercostal arteries	Elevates ribs
Splenius capitis	Spinotransverse	Nuchal ligament, spinous processes of C7–T4	Mastoid process of temporal bone, lateral third of superior nuchal line	Posterior rami of middle cervical nerves	Descending branch of occipital artery, deep cervical artery	*Bilaterally:* extends head *Unilaterally*: laterally bends (flexes) and rotates face to same side
Splenius cervicis	Spinotransverse	Spinous processes of T3–T6	Transverse processes (C1–C3)	Posterior rami of lower cervical nerves	Descending branch of occipital artery, deep cervical artery	*Bilaterally*: extends neck *Unilaterally:* laterally bends (flexes) and rotates neck toward same side
Trapezius	Superficial back	Superior nuchal line, external occipital protuberance, nuchal ligament, spinous processes of C7–T12	Lateral third of clavicle, acromion, spine of scapula	Accessory nerve (CN XI)	Transverse cervical artery, dorsal perforating branches of posterior intercostal arteries	Elevates, retracts, and rotates scapula; lower fibers depress scapula

Thoracic vertebrae, transverse section: superior view


Superior articular facet on head of rib
Intraarticular ligament
Radiate ligament of head of rib
Synovial cavities
Superior costotransverse ligament (*cut*)
Costotransverse ligament
Lateral costotransverse ligament
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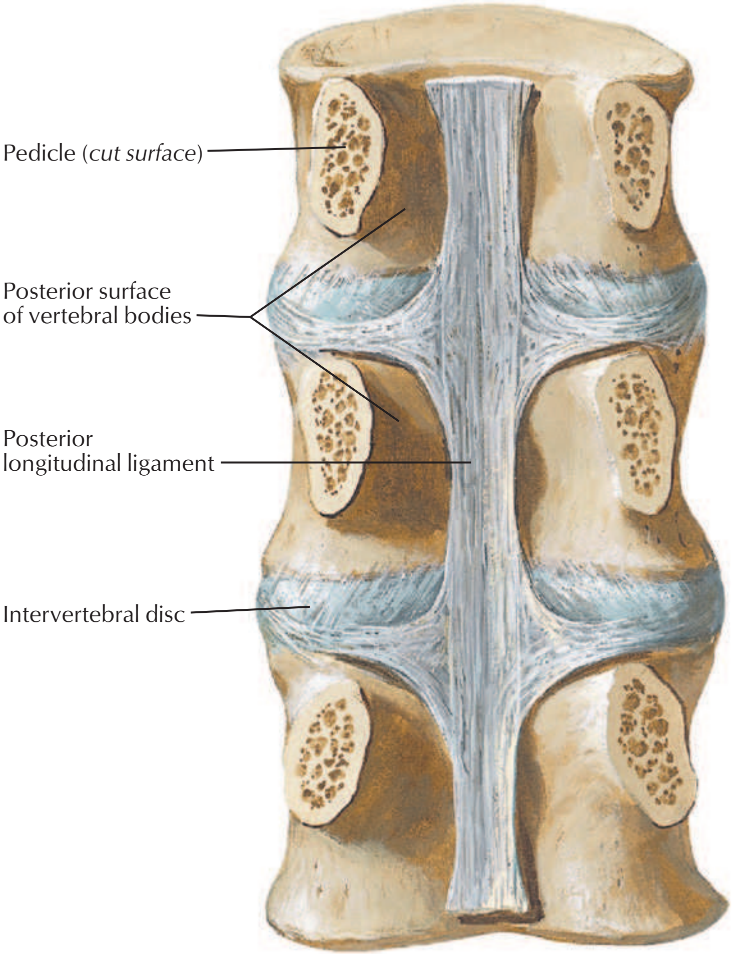
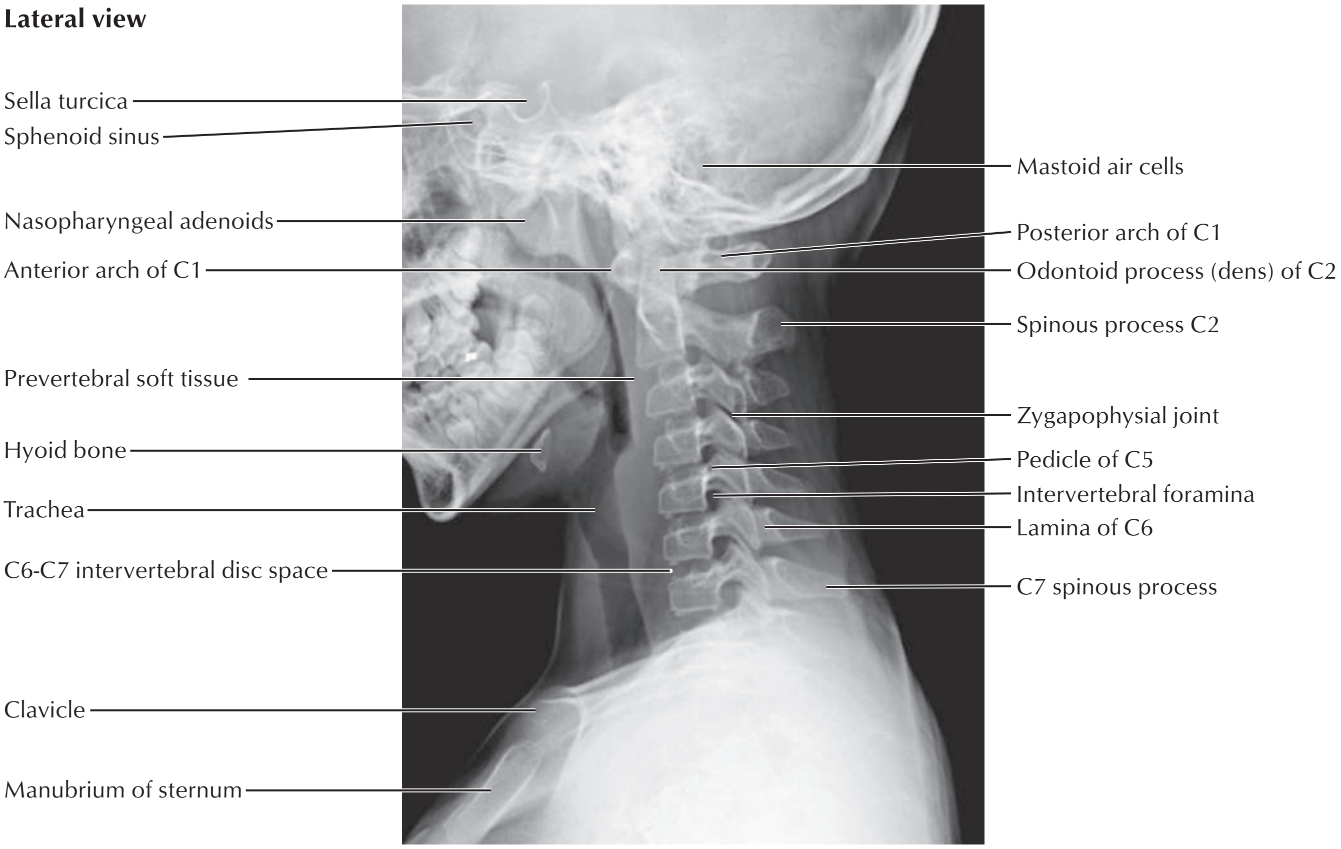
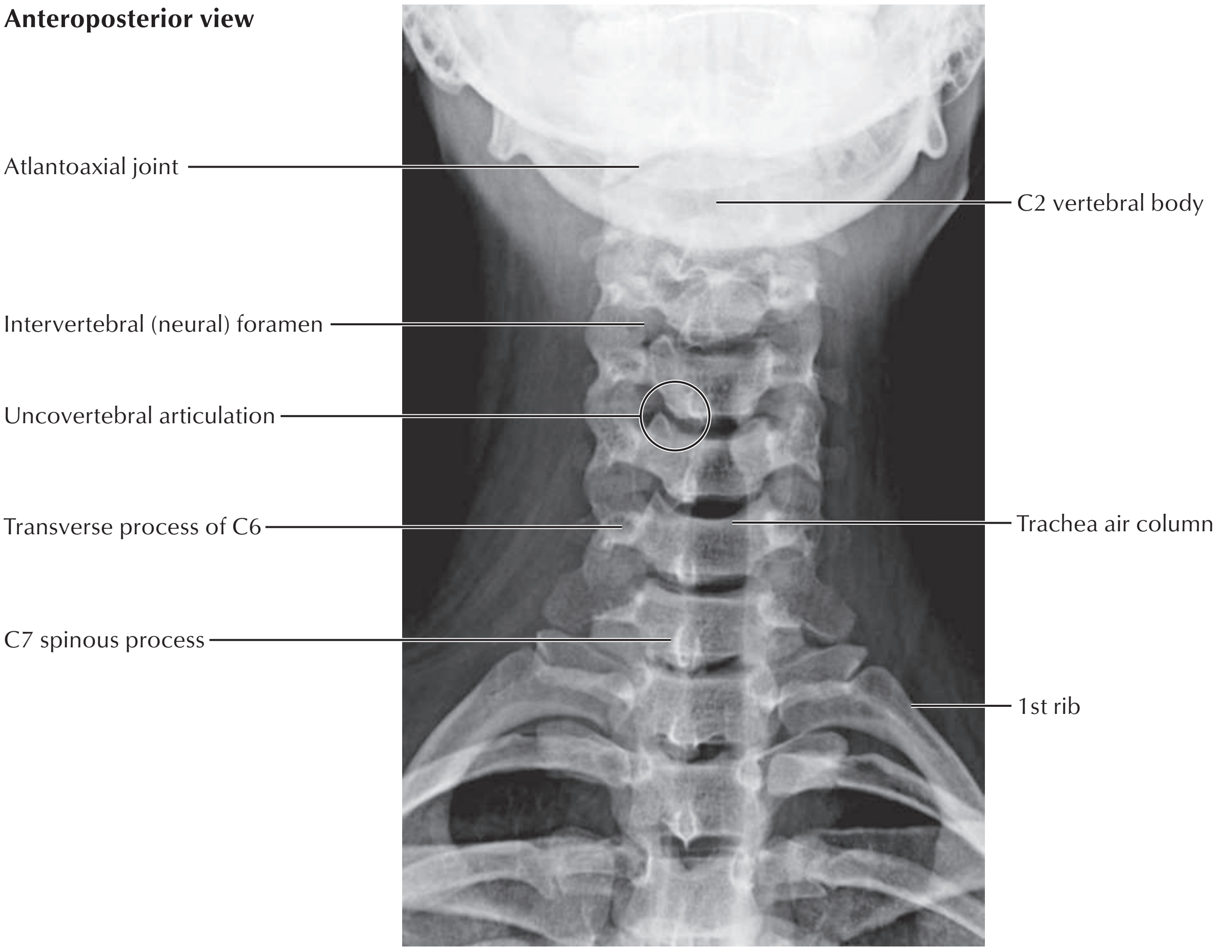
Lumbar anterior vertebral segments: posterior view (*pedicles sectioned*)


Pedicle (*cut surface*)
Posterior surface of vertebral bodies
Posterior longitudinal ligament
Intervertebral disc

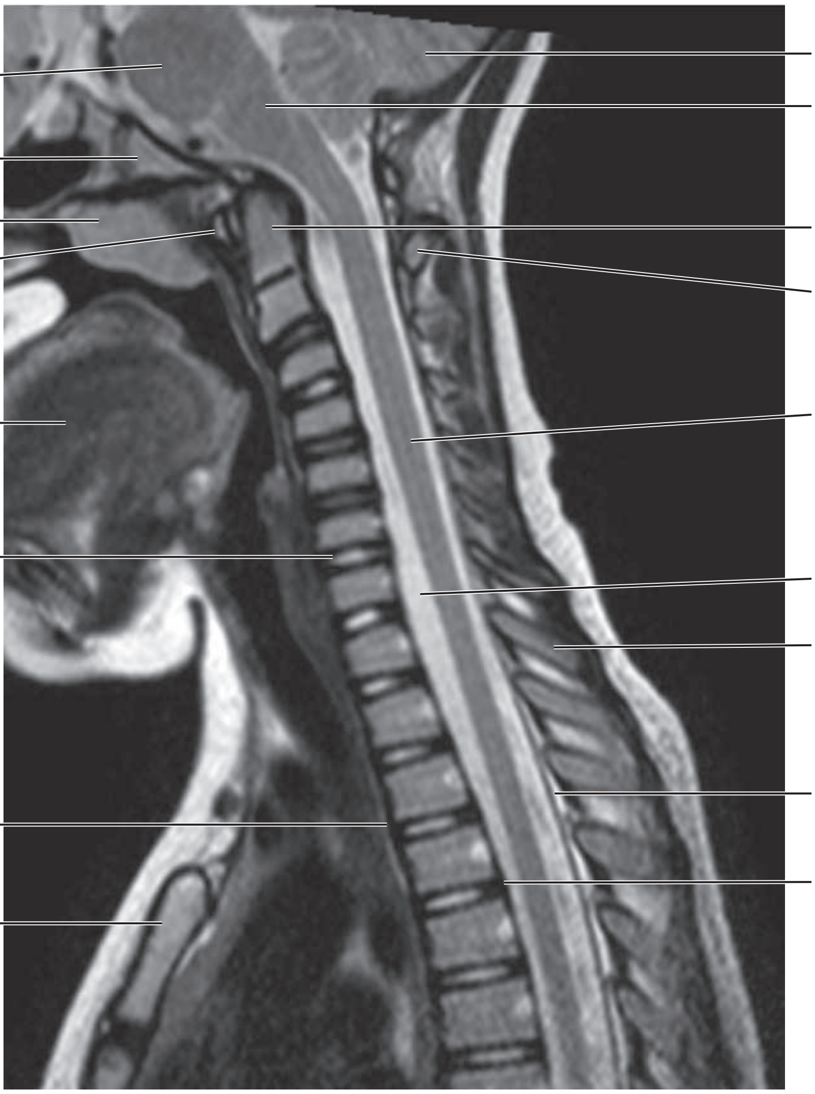
Lateral view


Sella turcica
Sphenoid sinus
Nasopharyngeal adenoids
Anterior arch of C1
Prevertebral soft tissue
Hyoid bone
Trachea
C6-C7 intervertebral disc space
Clavicle
Manubrium of sternum
Mastoid air cells
Posterior arch of C1
Odontoid process (dens) of C2
Spinous process C2
Zygapophysial joint
Pedicle of C5
Intervertebral foramina
Lamina of C6
C7 spinous process

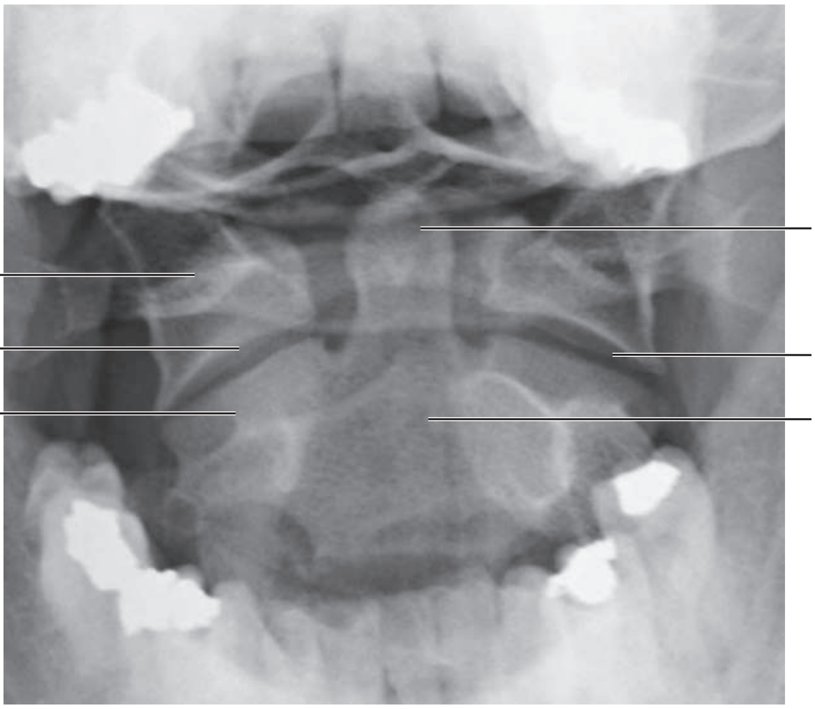
Anteroposterior view


Atlantoaxial joint
Intervertebral (neural) foramen
Uncovertebral articulation
Transverse process of C6
C7 spinous process
C2 vertebral body
Trachea air column
1st rib

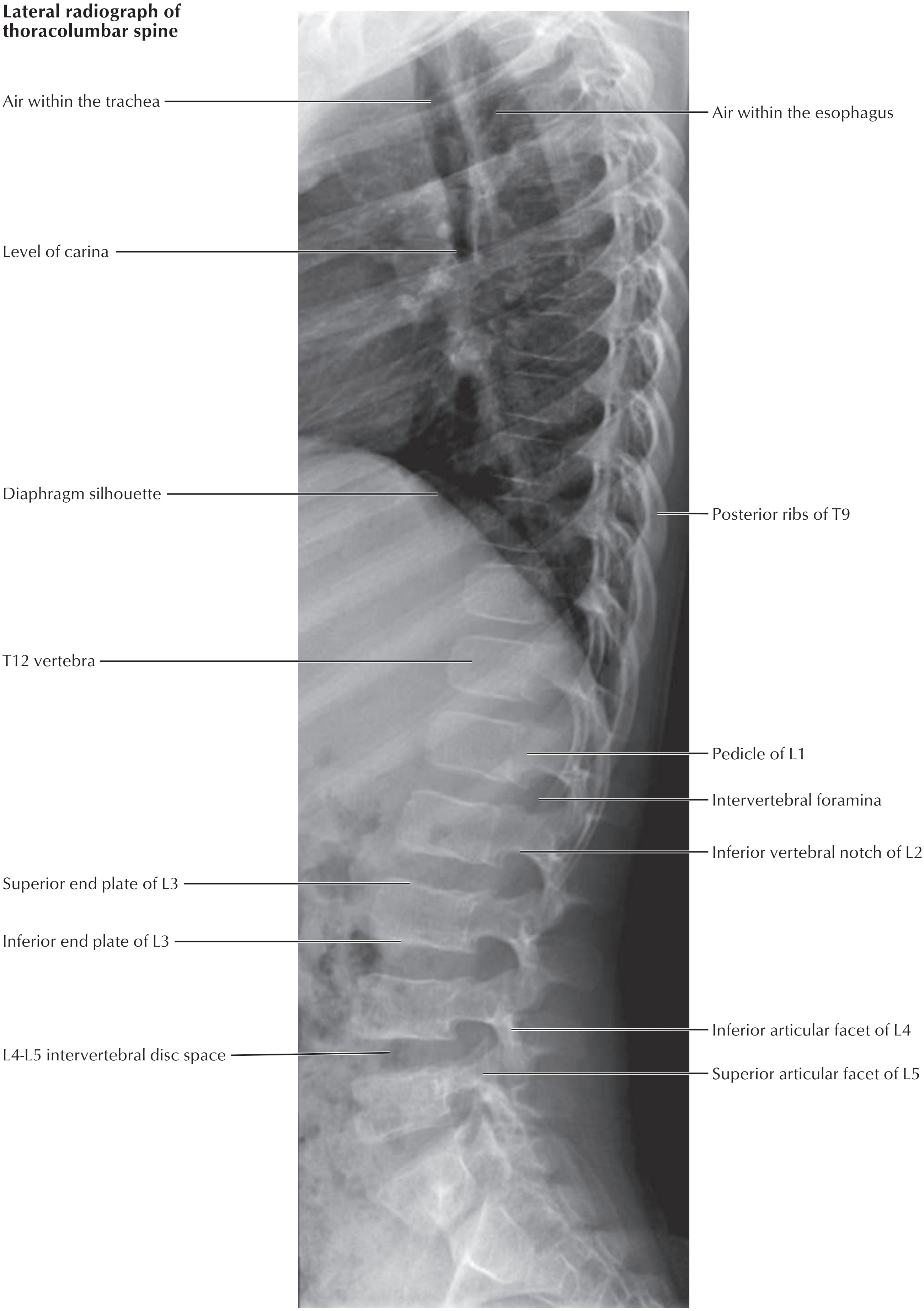
Sagittal T2-weighted MRI of cervical spine, without contrast


Pons
Clivus
Nasopharyngeal adenoids
Anterior arch of C1
Tongue
C6-C7 intervertebral disc
Anterior longitudinal ligament
Manubrium of sternum
Cerebellum
Medulla oblongata
Odontoid process of C2 (dens)
Posterior arch C1
Cervical spinal cord
Cerebral spinal fluid within the thecal sac
Spinous process of C7
Dura mater
Posterior longitudinal ligament

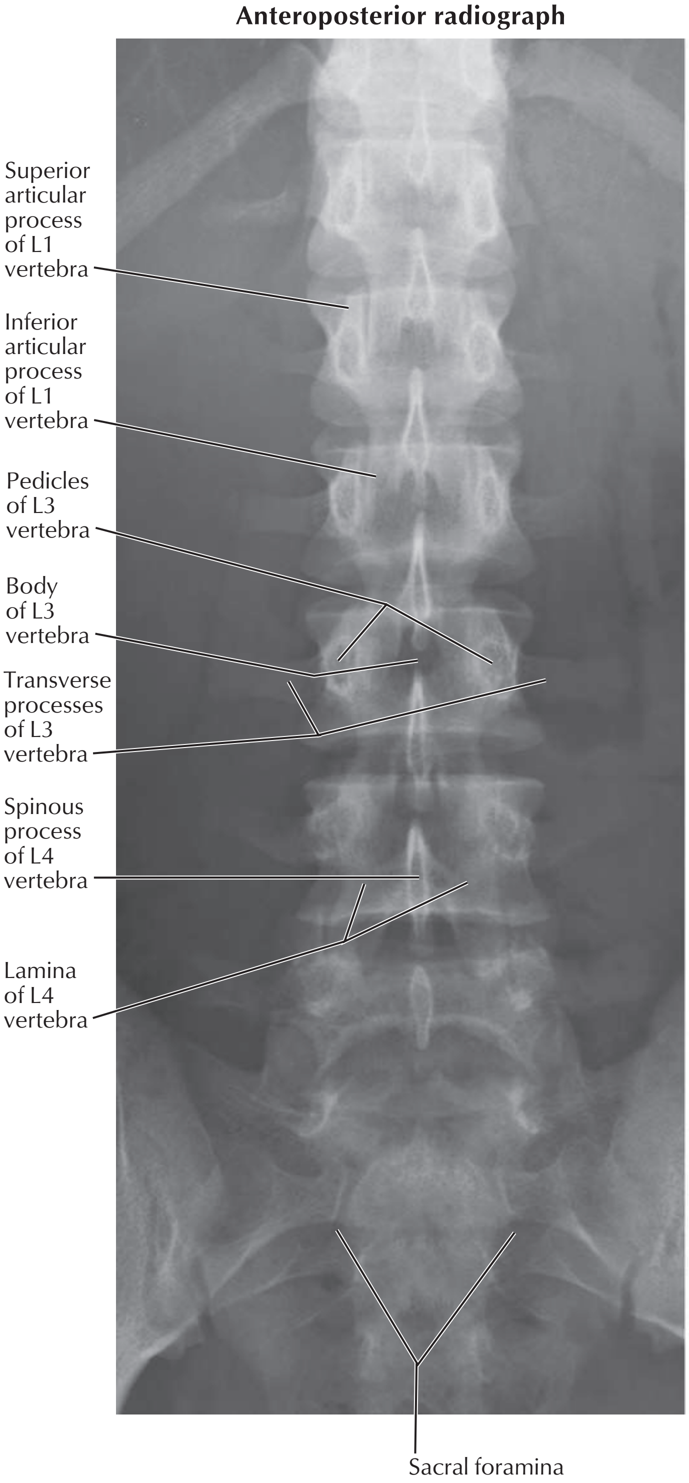
Open-mouth radiograph of cervical spine

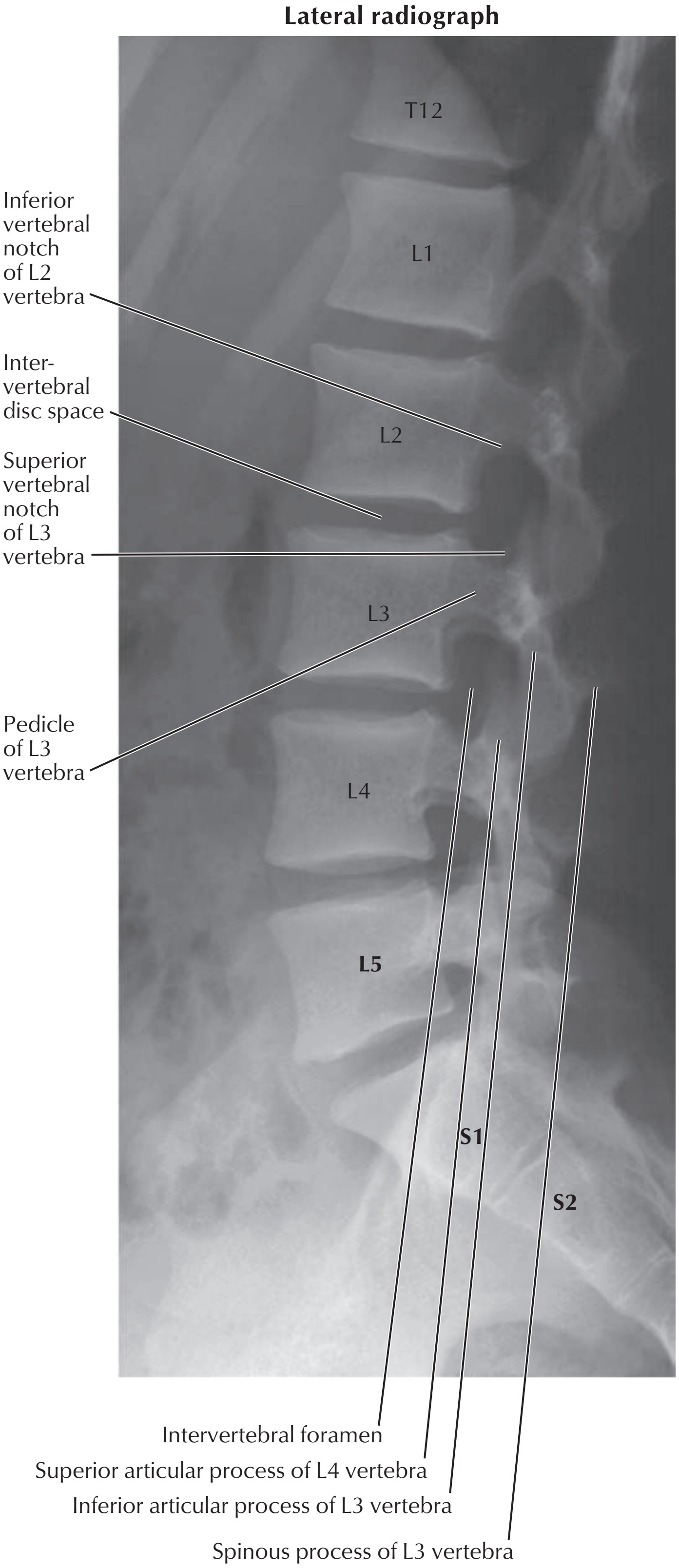

Superior articular surface of the atlas
Inferior articular surface of the atlas
Superior articular facet of the axis
Odontoid process C2 (dens)
Atlantoaxial articulation
Body of C2

Lateral radiograph of thoracolumbar spine


Air within the trachea
Air within the esophagus
Level of carina
Diaphragm silhouette
Posterior ribs of T9
T12 vertebra
Pedicle of L1
Intervertebral foramina
Inferior vertebral notch of L2
Superior end plate of L3
Inferior end plate of L3
Inferior articular facet of L4
L4-L5 intervertebral disc space
Superior articular facet of L5

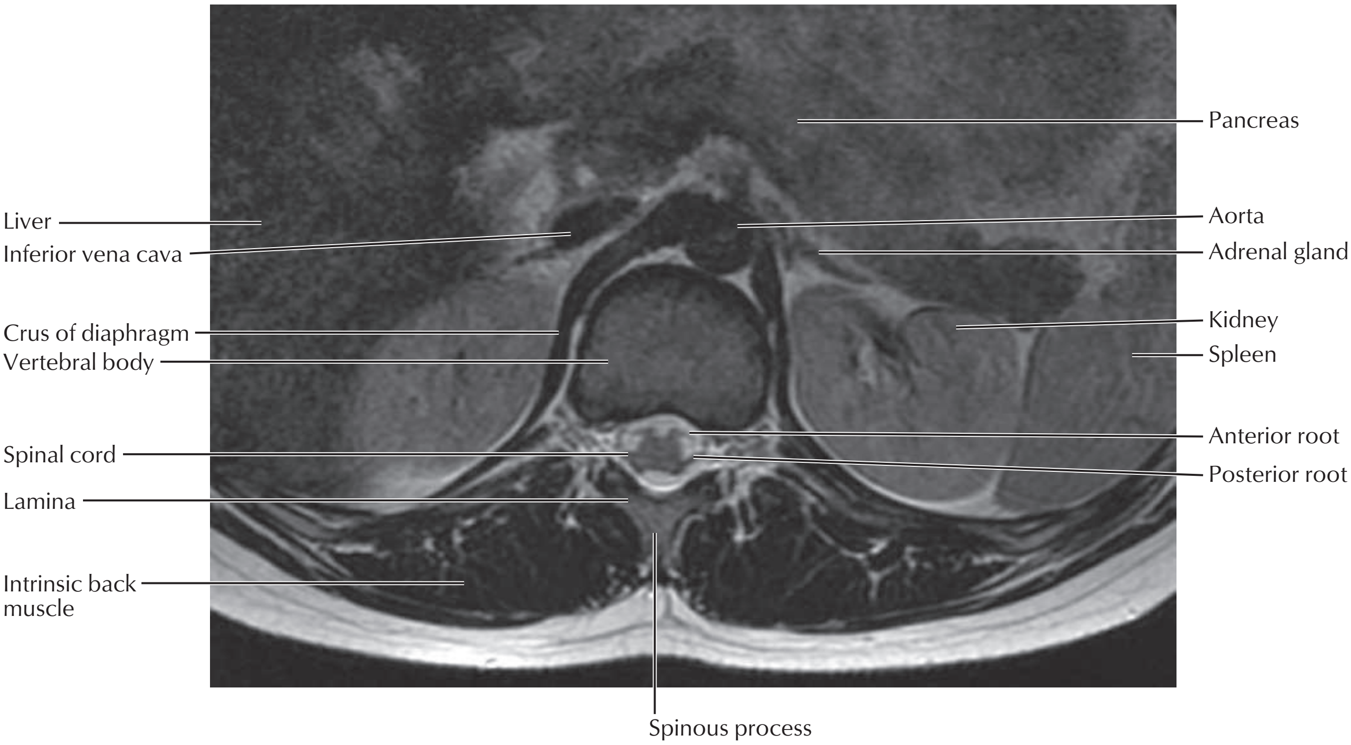
Radiographs of lumbar vertebrae


Anteroposterior radiograph
Superior articular process of L1 vertebra
Inferior articular process of L1 vertebra
Pedicles of L3 vertebra
Body of L3 vertebra
Transverse processes of L3 vertebra
Spinous process of L4 vertebra
Lamina of L4 vertebra
Sacral foramina

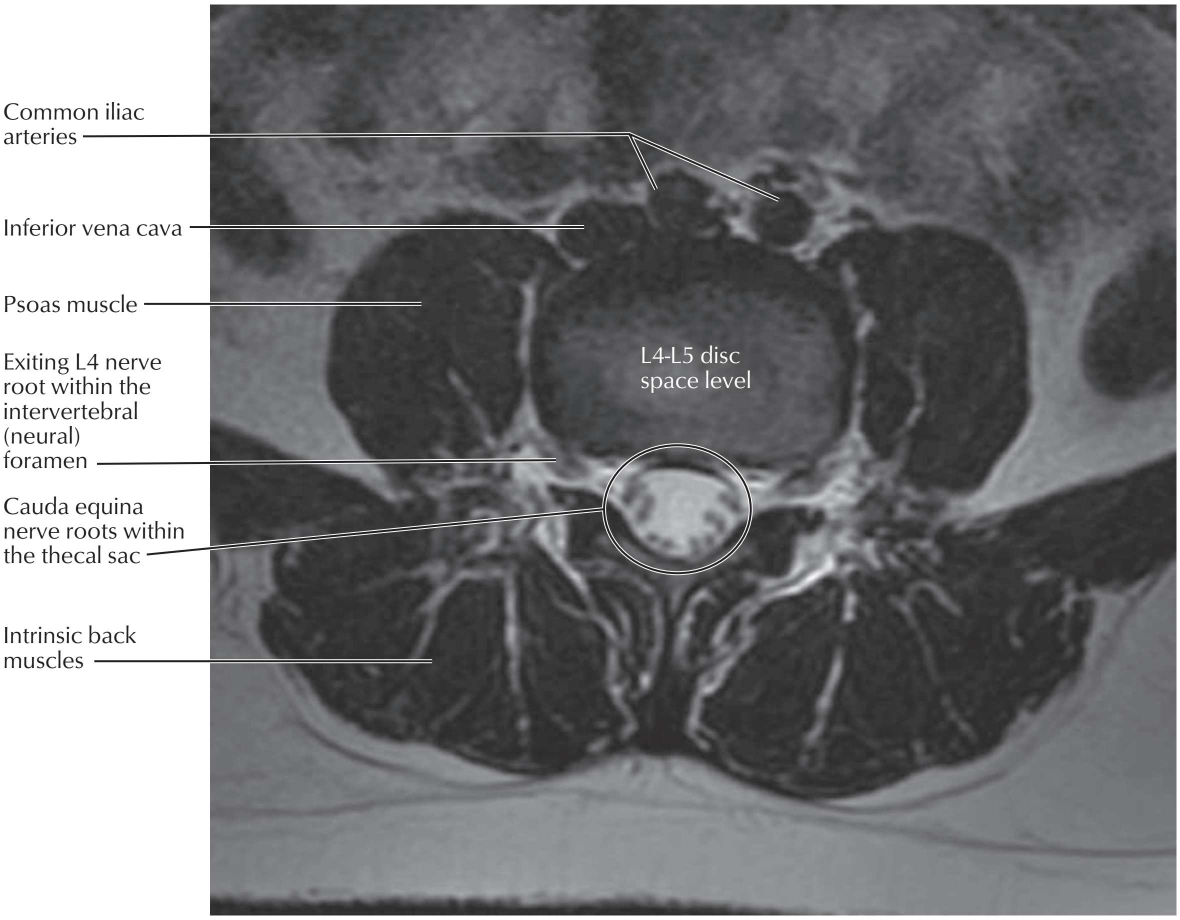

Lateral radiograph
T12
L1
L2
L3
L4
L5
S1
S2
Inferior vertebral notch of L2 vertebra
Inter-vertebral disc space
Superior vertebral notch of L3 vertebra
Pedicle of L3 vertebra
Intervertebral foramen
Superior articular process of L4 vertebra
Inferior articular process of L3 vertebra
Spinous process of L3 vertebra

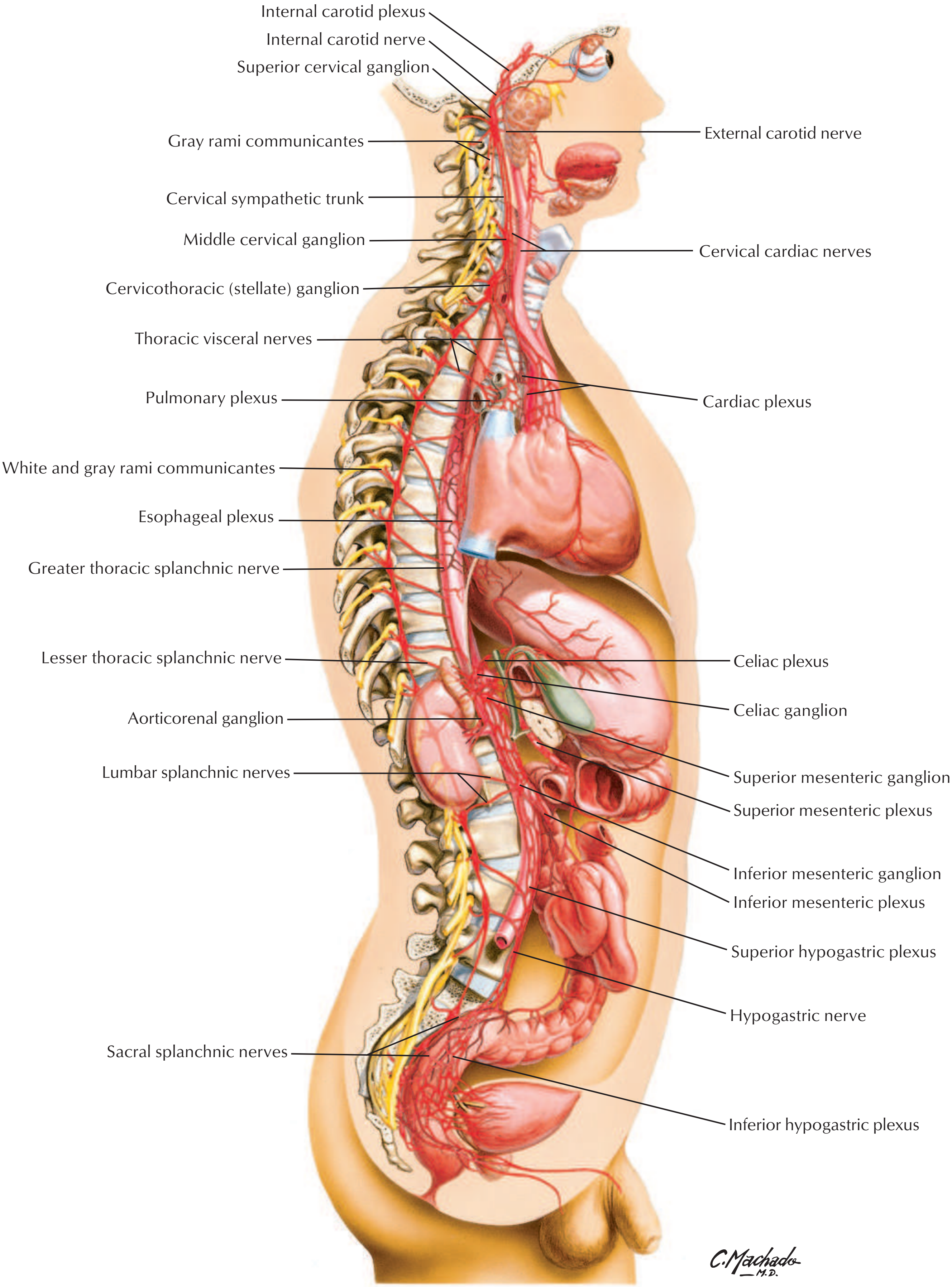
Note: *The vertebral bodies are numbered.*

Axial T2-weighted MRI section through upper lumbar level, without contrast


Pancreas
Liver
Inferior vena cava
Aorta
Adrenal gland
Crus of diaphragm
Vertebral body
Kidney
Spleen
Spinal cord
Anterior root
Posterior root
Lamina
Intrinsic back muscle
Spinous process

Axial T2-weighted MRI section through lower lumbar level, without contrast


Common iliac arteries
Inferior vena cava
Psoas muscle
L4-L5 disc space level
Exiting L4 nerve root within the intervertebral (neural) foramen
Cauda equina nerve roots within the thecal sac
Intrinsic back muscles


Internal carotid plexus
Internal carotid nerve
Superior cervical ganglion
Gray rami communicantes
Cervical sympathetic trunk
Middle cervical ganglion
Cervicothoracic (stellate) ganglion
Thoracic visceral nerves
Pulmonary plexus
White and gray rami communicantes
Esophageal plexus
Greater thoracic splanchnic nerve
Lesser thoracic splanchnic nerve
Aorticorenal ganglion
Lumbar splanchnic nerves
Sacral splanchnic nerves
External carotid nerve
Cervical cardiac nerves
Cardiac plexus
Celiac plexus
Celiac ganglion
Superior mesenteric ganglion
Superior mesenteric plexus
Inferior mesenteric ganglion
Inferior mesenteric plexus
Superior hypogastric plexus
Hypogastric nerve
Inferior hypogastric plexus
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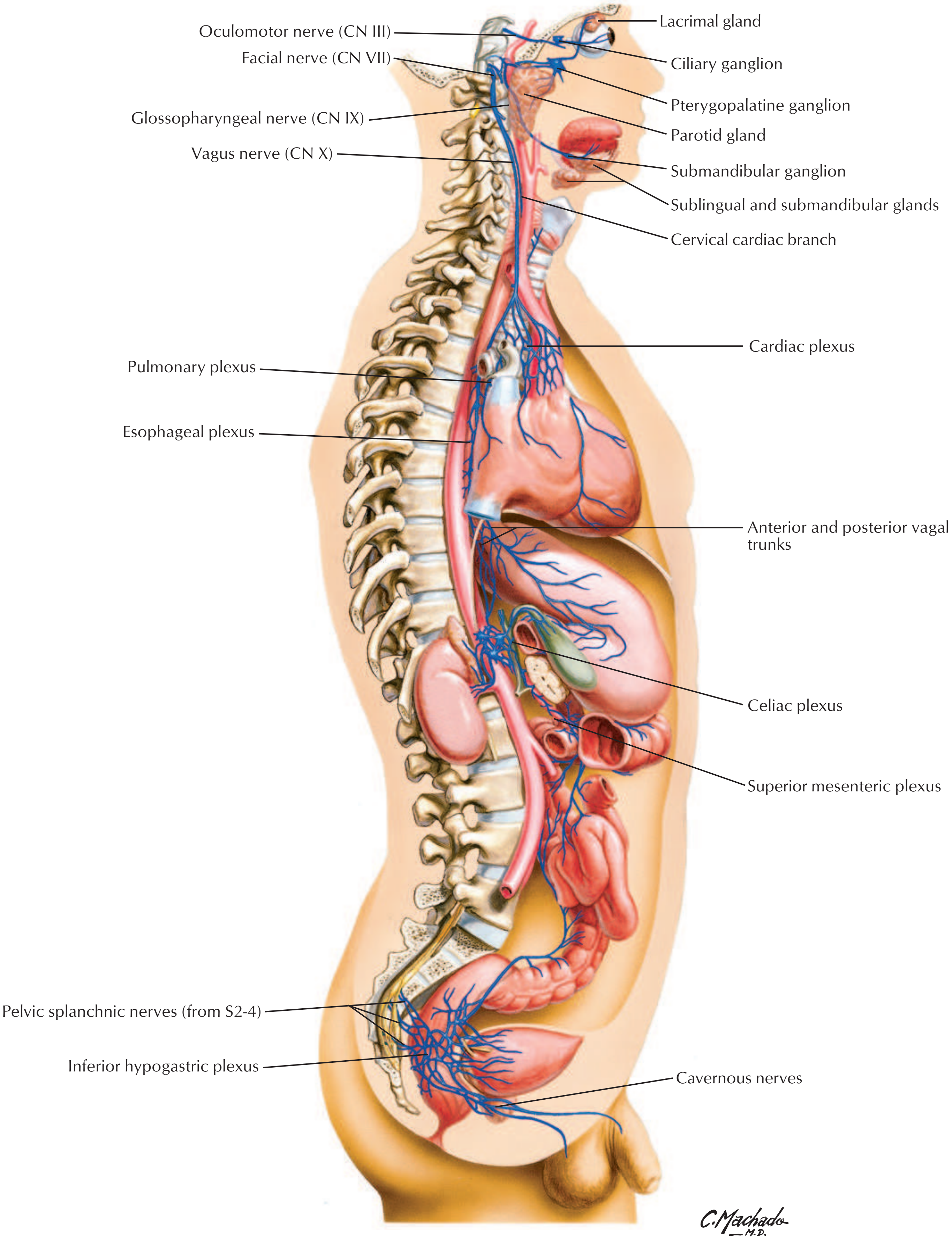
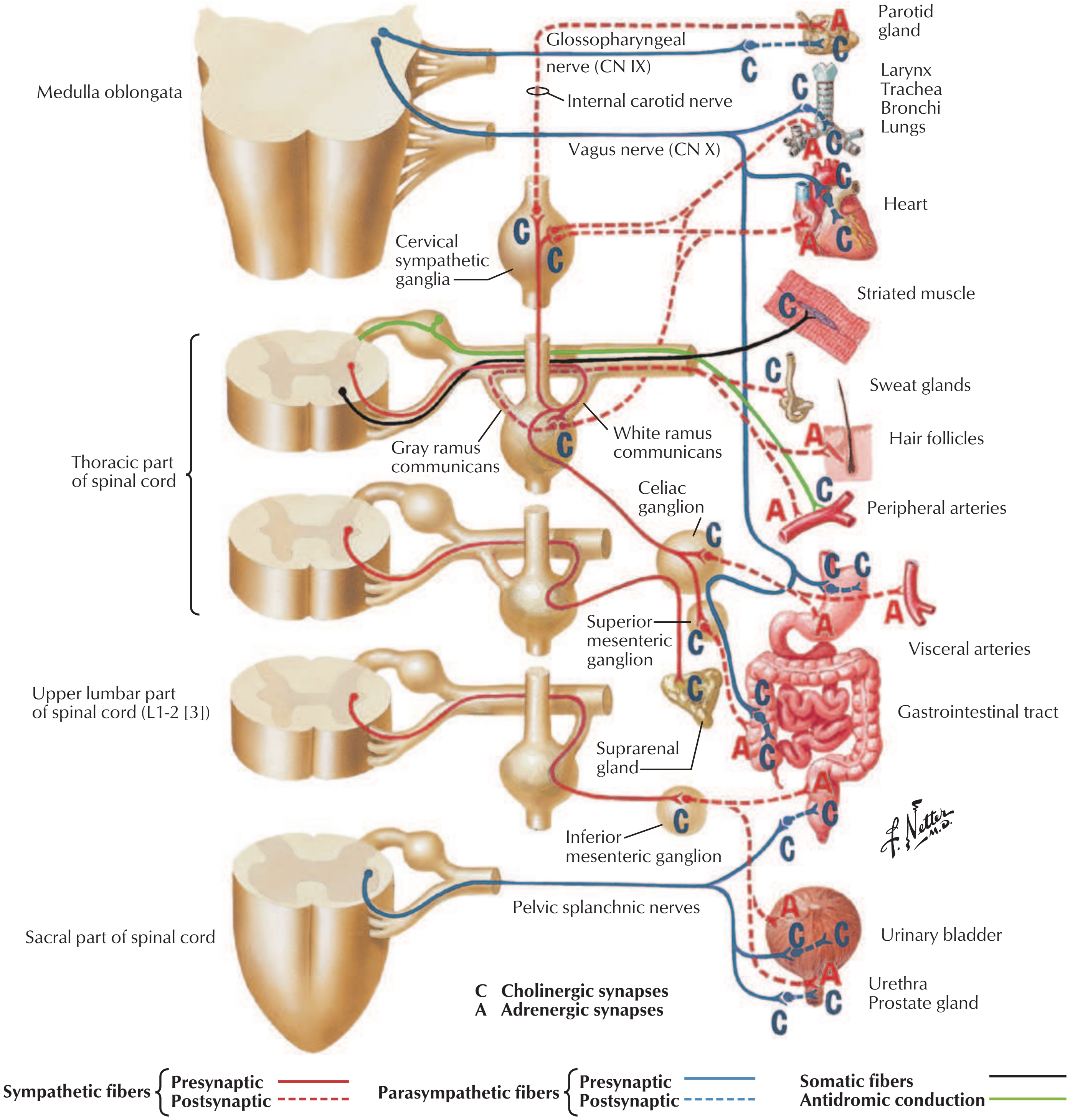
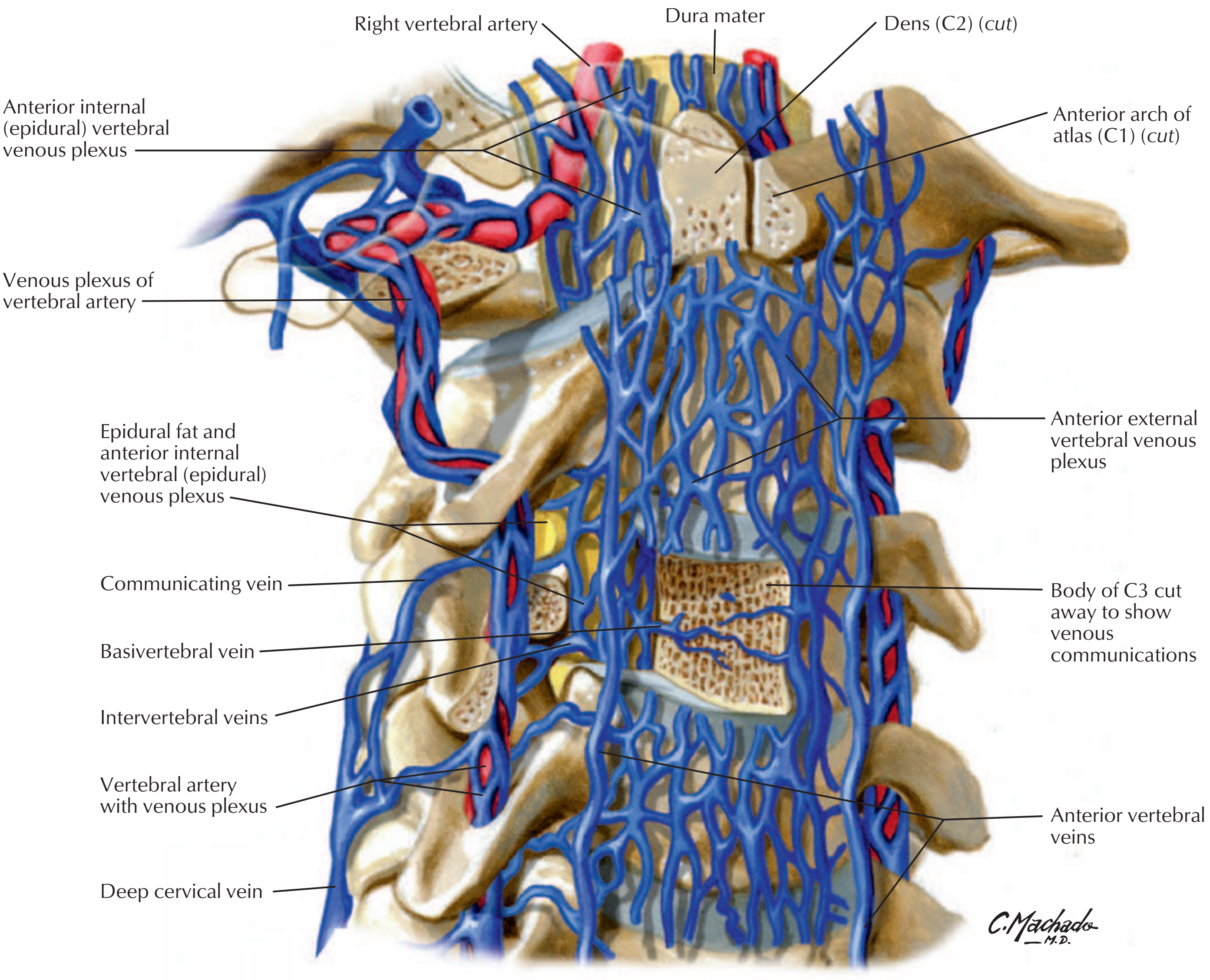
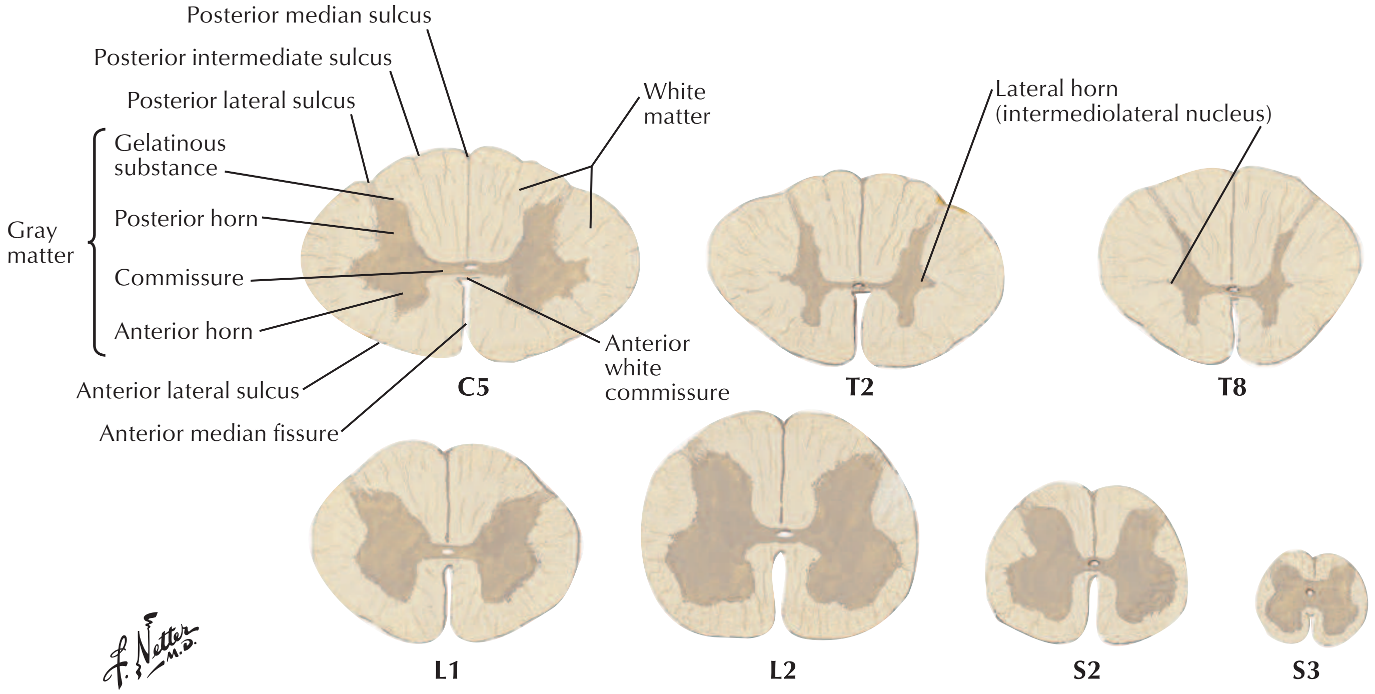

Oculomotor nerve (CN III)
Facial nerve (CN VII)
Glossopharyngeal nerve (CN IX)
Vagus nerve (CN X)
Lacrimal gland
Ciliary ganglion
Pterygopalatine ganglion
Parotid gland
Submandibular ganglion
Sublingual and submandibular glands
Cervical cardiac branch
Cardiac plexus
Pulmonary plexus
Esophageal plexus
Anterior and posterior vagal trunks
Celiac plexus
Superior mesenteric plexus
Pelvic splanchnic nerves (from S2-4)
Inferior hypogastric plexus
Cavernous nerves
C. Machado M.D.


Parotid gland
Glossopharyngeal nerve (CN IX)
Larynx
Trachea
Bronchi
Lungs
Medulla oblongata
Internal carotid nerve
Vagus nerve (CN X)
Heart
Cervical sympathetic ganglia
Striated muscle
Sweat glands
Hair follicles
White ramus communicans
Gray ramus communicans
Thoracic part of spinal cord
Celiac ganglion
Peripheral arteries
Visceral arteries
Superior mesenteric ganglion
Upper lumbar part of spinal cord (L1-2 [3])
Gastrointestinal tract
Suprarenal gland
Inferior mesenteric ganglion
Pelvic splanchnic nerves
Sacral part of spinal cord
Urinary bladder
Urethra
Prostate gland
C Cholinergic synapses
A Adrenergic synapses
Sympathetic fibers
Presynaptic
Postsynaptic
Parasympathetic fibers
Presynaptic
Postsynaptic
Somatic fibers
Antidromic conduction

Vertebral Veins: Detail Showing Venous Communications

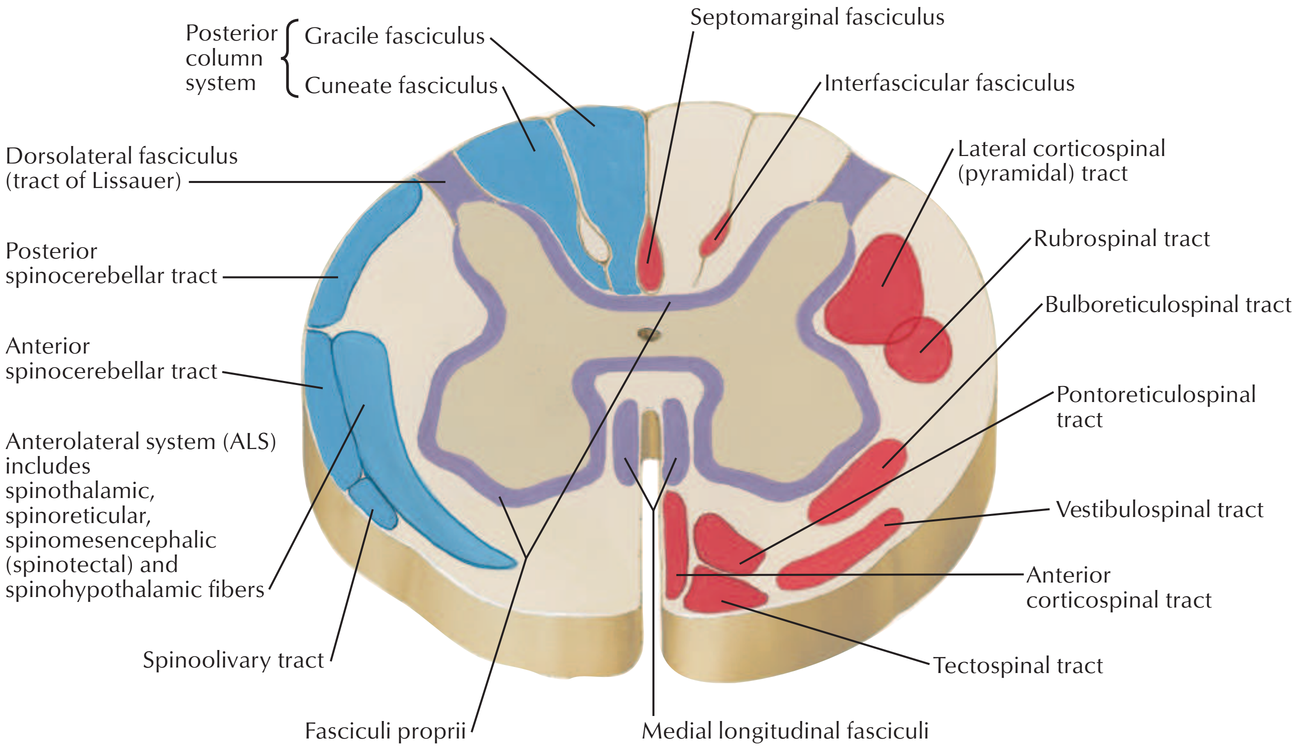

Right vertebral artery
Dura mater
Dens (C2) (*cut*)
Anterior internal (epidural) vertebral venous plexus
Anterior arch of atlas (C1) (*cut*)
Venous plexus of vertebral artery
Anterior external vertebral venous plexus
Epidural fat and anterior internal vertebral (epidural) venous plexus
Communicating vein
Body of C3 cut away to show venous communications
Basivertebral vein
Intervertebral veins
Vertebral artery with venous plexus
Anterior vertebral veins
Deep cervical vein
C.Machado M.D.

Sections through spinal cord at various levels


Posterior median sulcus
Posterior intermediate sulcus
Posterior lateral sulcus
Gray matter
Gelatinous substance
Posterior horn
Commissure
Anterior horn
Anterior lateral sulcus
Anterior median fissure
White matter
Anterior white commissure
Lateral horn (intermediolateral nucleus)
C5
T2
T8
L1
L2
S2
S3

Principal fiber tracts of spinal cord

🟦 **Ascending pathways**
🟥 **Descending pathways**
🟪 **Fibers passing in both directions**


Posterior column system
Gracile fasciculus
Cuneate fasciculus
Dorsolateral fasciculus (tract of Lissauer)
Posterior spinocerebellar tract
Anterior spinocerebellar tract
Anterolateral system (ALS) includes spinothalamic, spinoreticular, spinomesencephalic (spinotectal) and spinohypothalamic fibers
Spinoolivary tract
Fasciculi proprii
Medial longitudinal fasciculi
Septomarginal fasciculus
Interfascicular fasciculus
Lateral corticospinal (pyramidal) tract
Rubrospinal tract
Bulboreticulospinal tract
Pontoreticulospinal tract
Vestibulospinal tract
Anterior corticospinal tract
Tectospinal tract

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THORAX

4

Surface Anatomy	187
Mammary Gland	188-191
Body Wall	192-201
Lungs	202-214
Heart	215-233
Mediastinum	234-243
Regional Scans	244
Cross-Sectional Anatomy	245-248
Structures with High Clinical Significance	Tables 4.1-4.2
Muscle Table	Table 4.3
Electronic Bonus Plates	BP44-BP57

ELECTRONIC BONUS PLATES

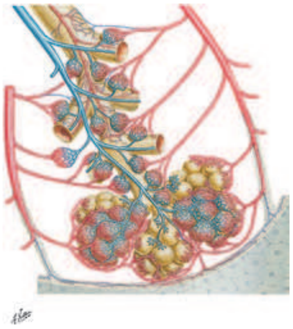
BP44 Respiratory System

BP45 Cervical Ribs and Related Anomalies

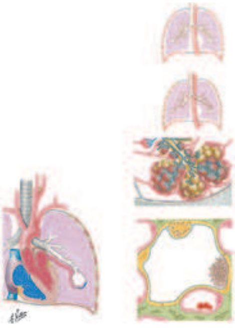
BP46 Muscle Attachments of Ribs

BP47 Muscles of Respiration

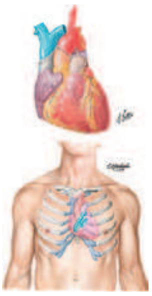
BP48 Intrapulmonary Airways: Schema



BP49 Intrapulmonary Blood Circulation: Schema

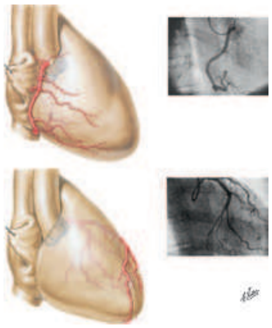


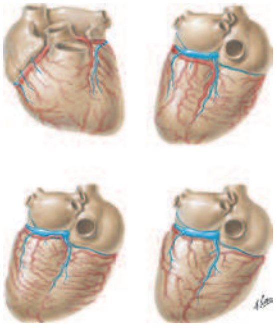
BP50 Gas Exchange

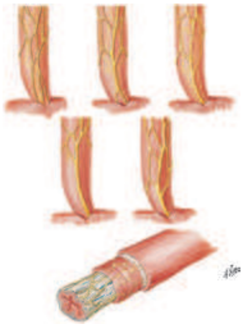


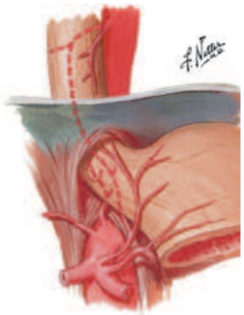
BP51 Anterior Aspect of Heart

ELECTRONIC BONUS PLATES—*cont'd*

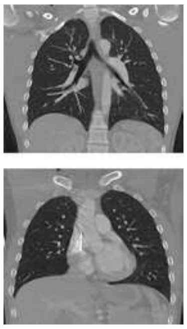

BP52 Coronary Arteries: Right Anterior Oblique Views with Arteriograms


BP53 Coronary Arteries and Cardiac Veins: Variations

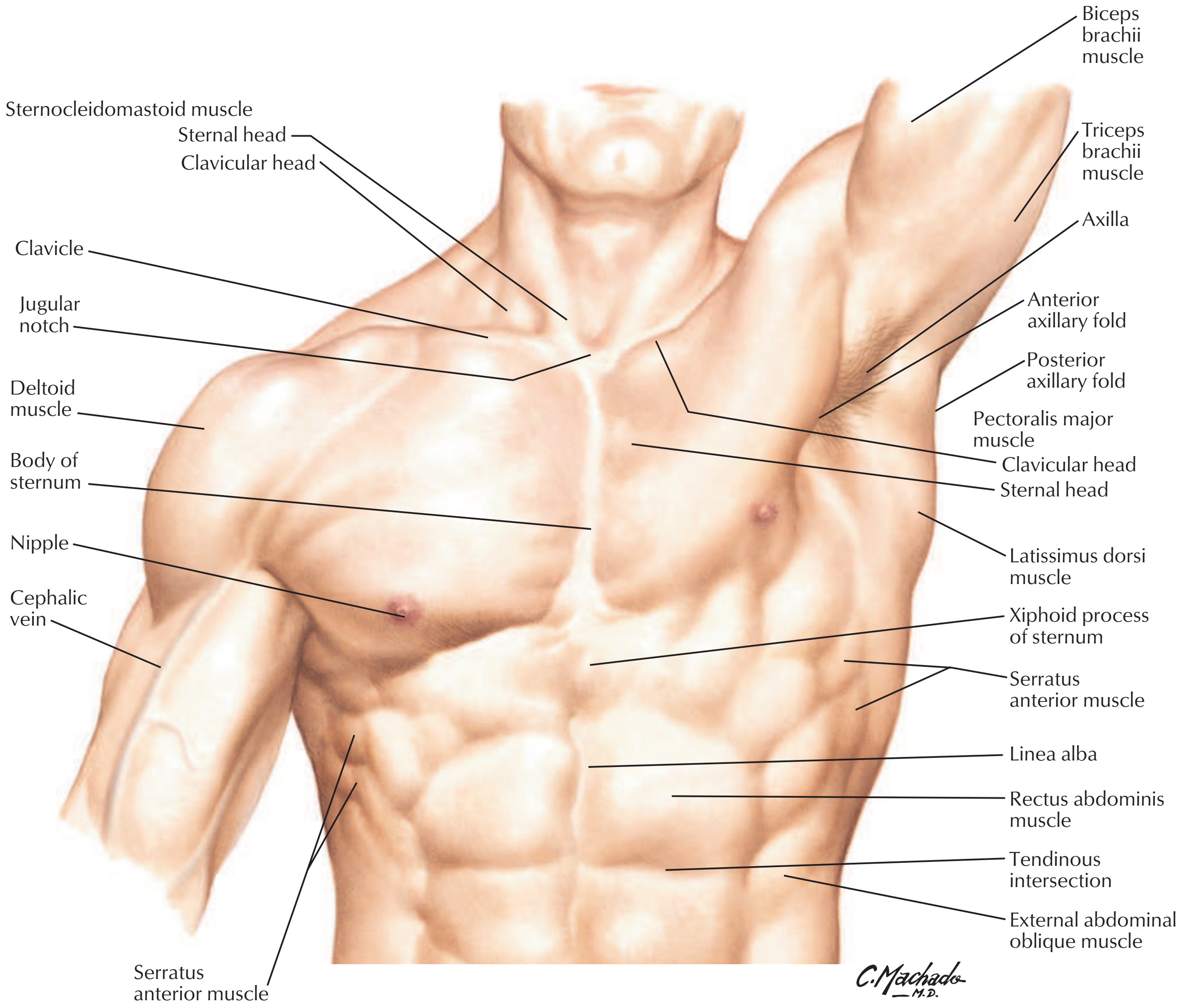

BP54 Intrinsic Nerves and Variations in Nerves of Esophagus

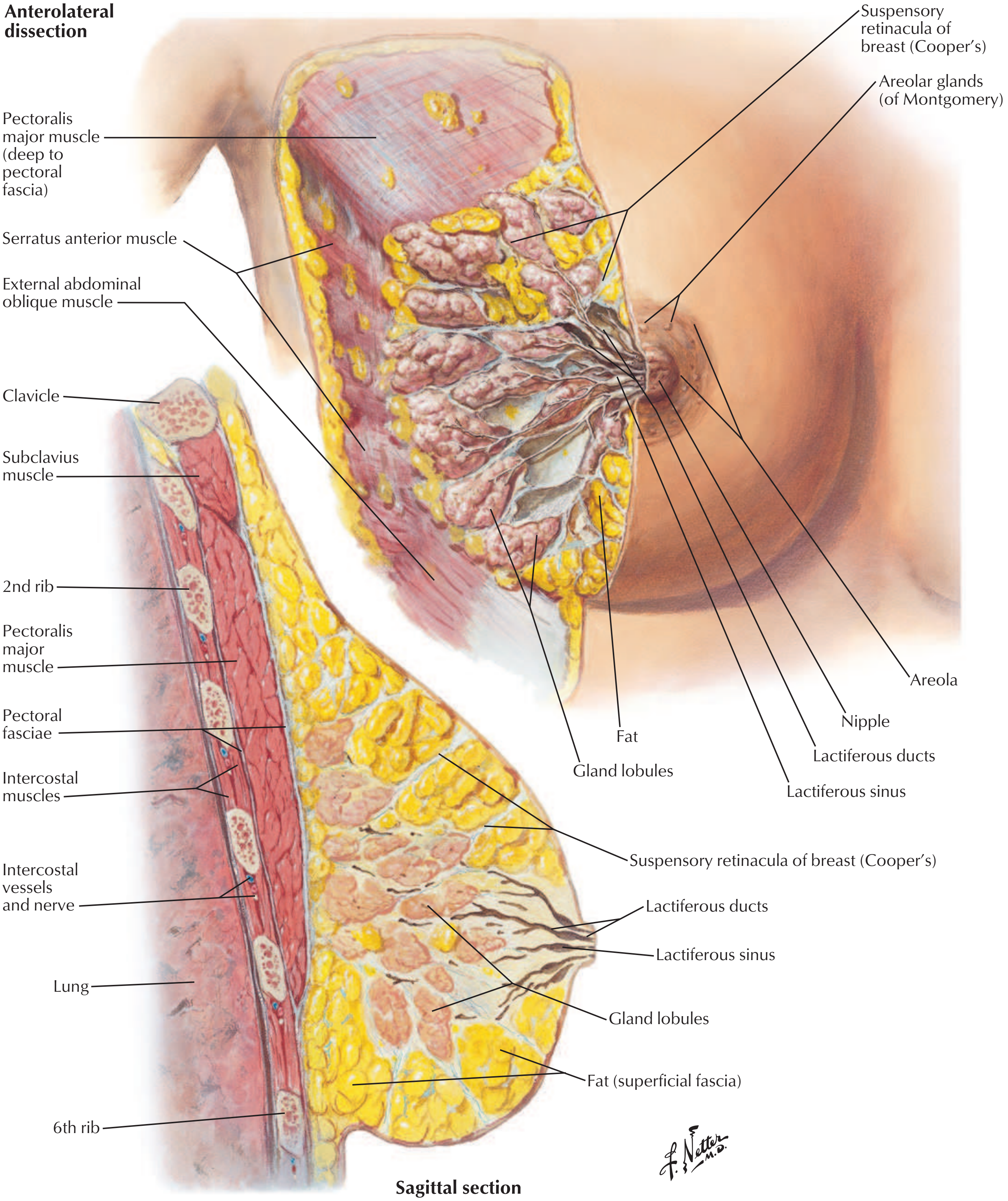

BP55 Arteries of Esophagus: Variations

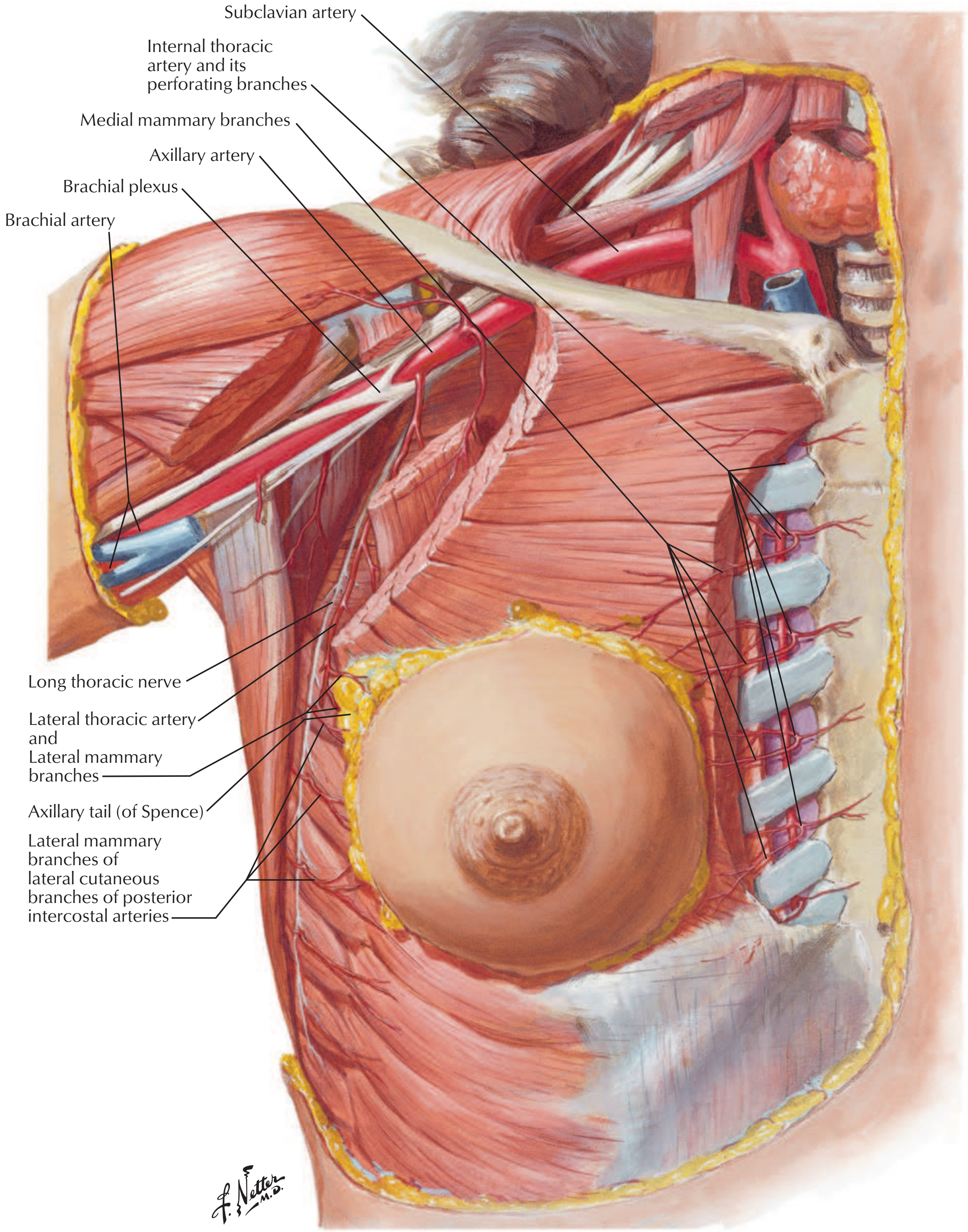
BP56 Thorax: Coronal Section (Midaxillary Line, Tracheal Bifurcation, Left Atrium)


BP57 Thorax: Coronal CTs

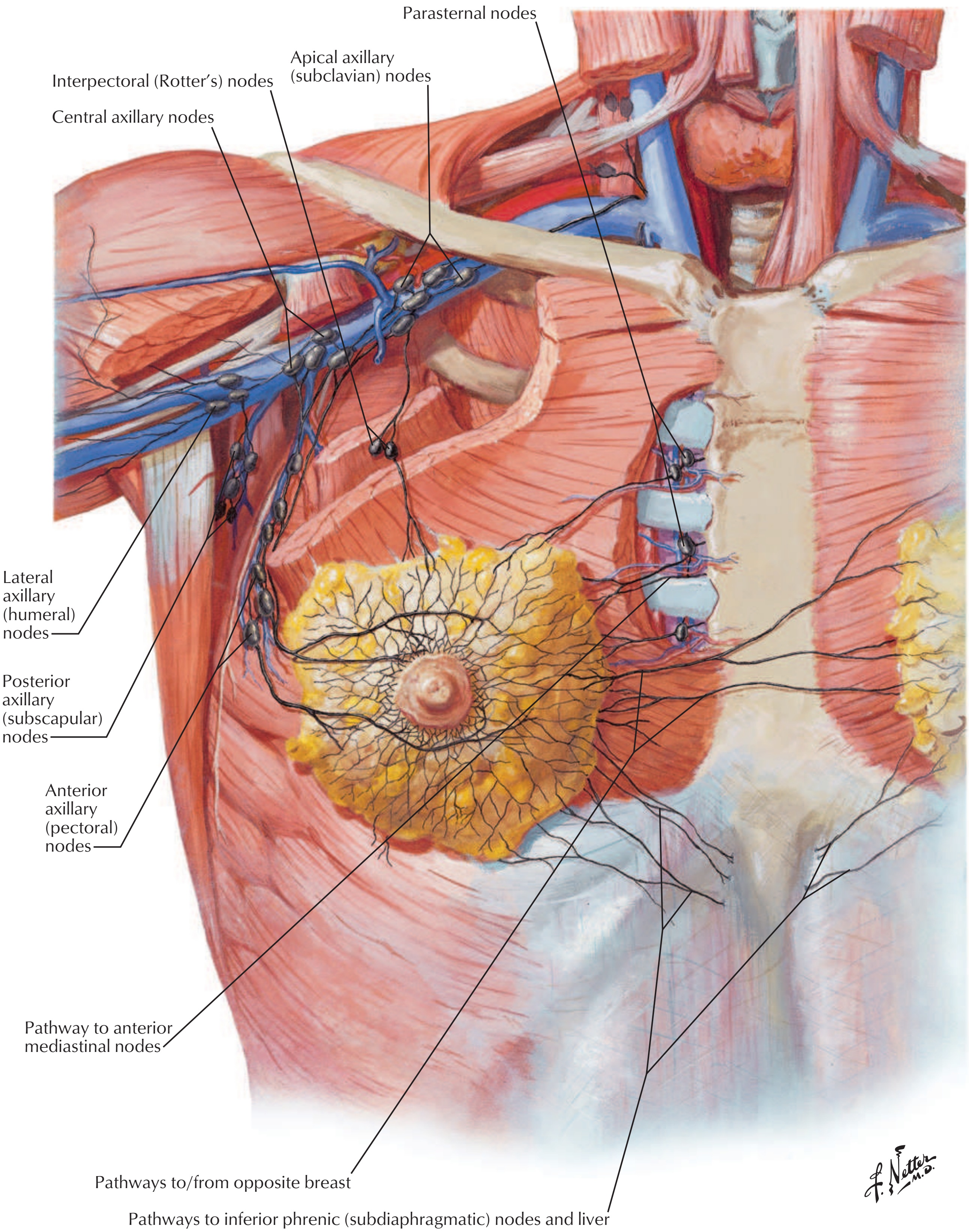
See also Plates 171, 194


Sternocleidomastoid muscle
Sternal head
Clavicular head
Clavicle
Jugular notch
Deltoid muscle
Body of sternum
Nipple
Cephalic vein
Serratus anterior muscle
Biceps brachii muscle
Triceps brachii muscle
Axilla
Anterior axillary fold
Posterior axillary fold
Pectoralis major muscle
Clavicular head
Sternal head
Latissimus dorsi muscle
Xiphoid process of sternum
Serratus anterior muscle
Linea alba
Rectus abdominis muscle
Tendinous intersection
External abdominal oblique muscle
C. Machado M.D.

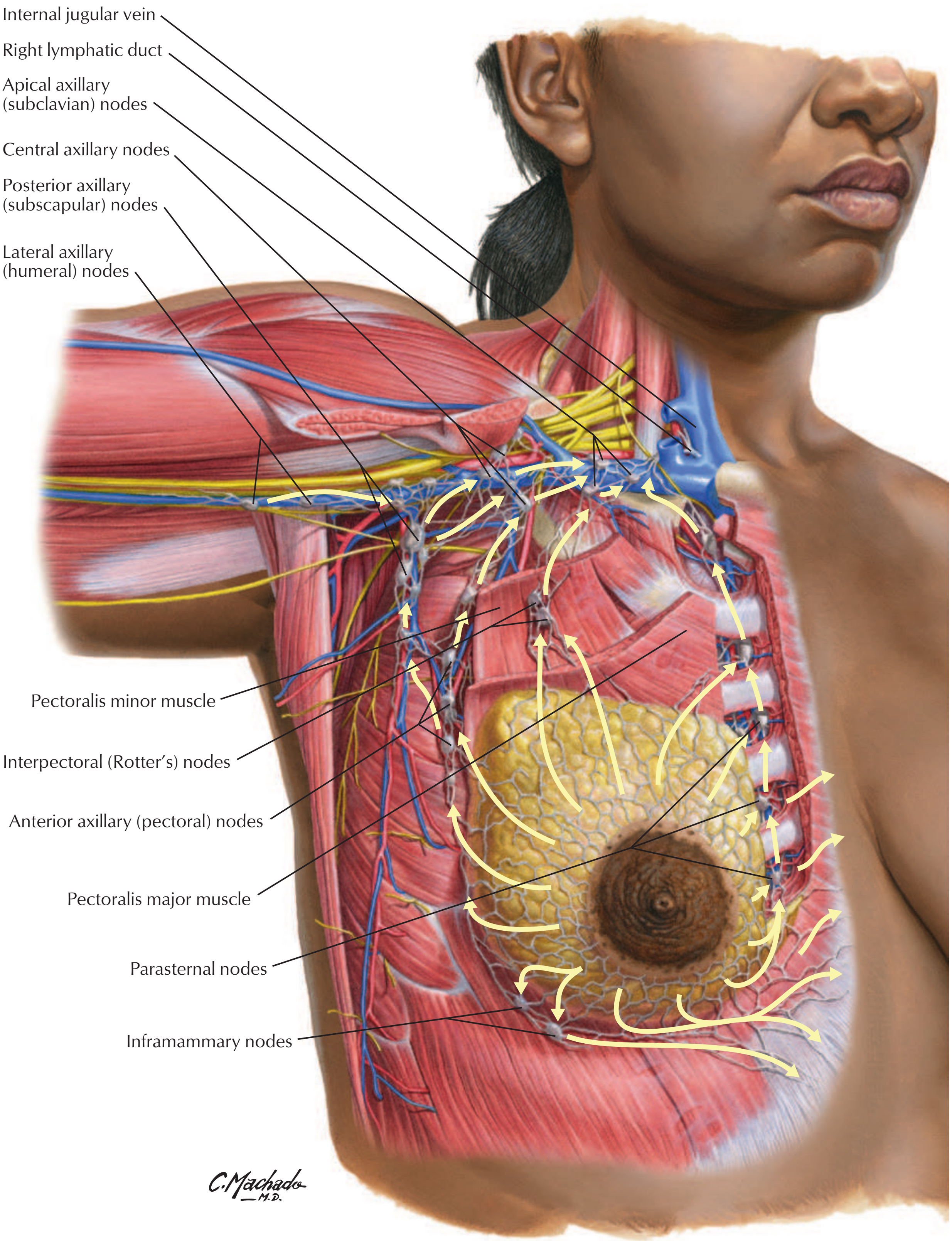

Anterolateral dissection
Pectoralis major muscle (deep to pectoral fascia)
Serratus anterior muscle
External abdominal oblique muscle
Suspensory retinacula of breast (Cooper's)
Areolar glands (of Montgomery)
Areola
Nipple
Lactiferous ducts
Lactiferous sinus
Fat
Gland lobules
Clavicle
Subclavius muscle
2nd rib
Pectoralis major muscle
Pectoral fasciae
Intercostal muscles
Intercostal vessels and nerve
Lung
6th rib
Suspensory retinacula of breast (Cooper's)
Lactiferous ducts
Lactiferous sinus
Gland lobules
Fat (superficial fascia)
Sagittal section


Subclavian artery
Internal thoracic artery and its perforating branches
Medial mammary branches
Axillary artery
Brachial plexus
Brachial artery
Long thoracic nerve
Lateral thoracic artery and Lateral mammary branches
Axillary tail (of Spence)
Lateral mammary branches of lateral cutaneous branches of posterior intercostal arteries
F. Netter M.D.

Lymph Vessels and Nodes of Mammary Gland

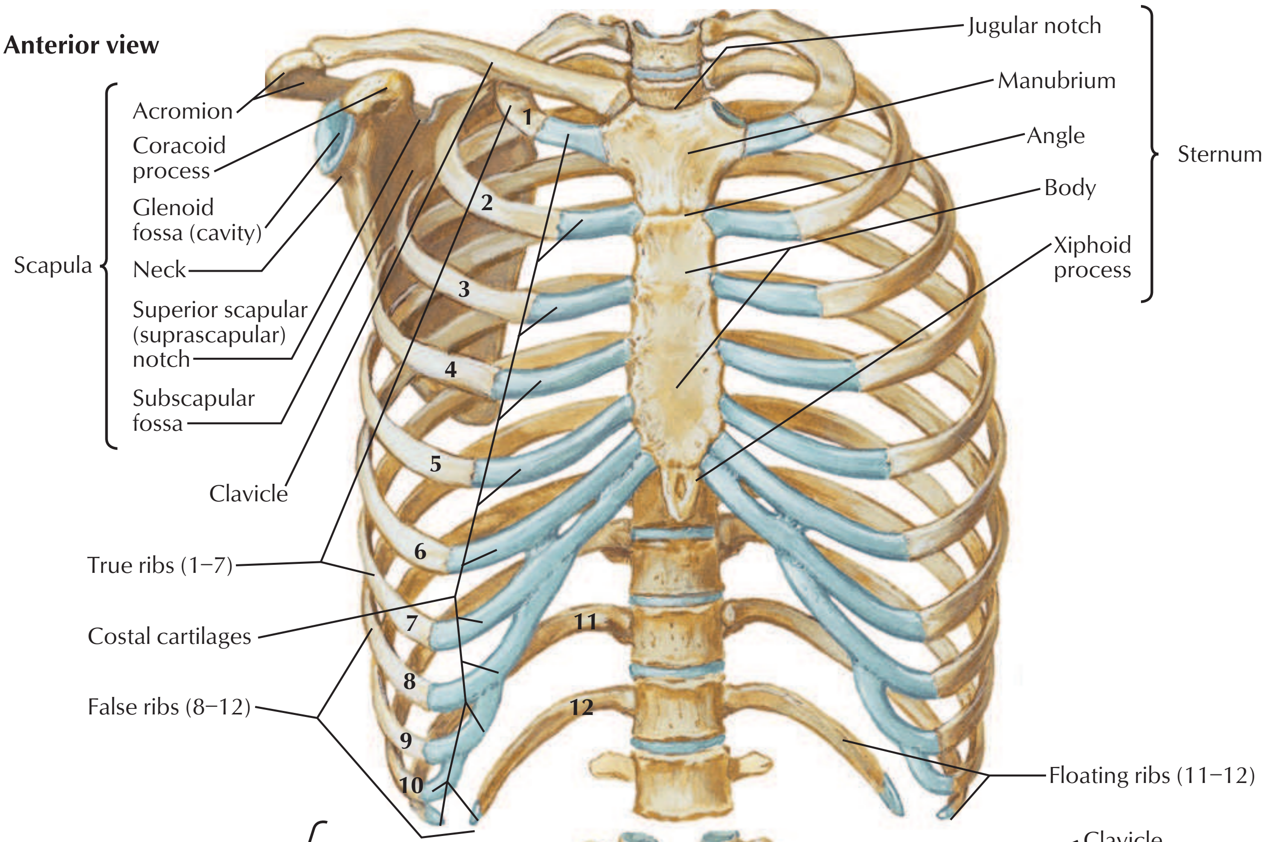

Parasternal nodes
Apical axillary (subclavian) nodes
Interpectoral (Rotter's) nodes
Central axillary nodes
Lateral axillary (humeral) nodes
Posterior axillary (subscapular) nodes
Anterior axillary (pectoral) nodes
Pathway to anterior mediastinal nodes
Pathways to/from opposite breast
Pathways to inferior phrenic (subdiaphragmatic) nodes and liver

See also Plate 190


Internal jugular vein
Right lymphatic duct
Apical axillary (subclavian) nodes
Central axillary nodes
Posterior axillary (subscapular) nodes
Lateral axillary (humeral) nodes
Pectoralis minor muscle
Interpectoral (Rotter's) nodes
Anterior axillary (pectoral) nodes
Pectoralis major muscle
Parasternal nodes
Inframammary nodes
C. Machado M.D.

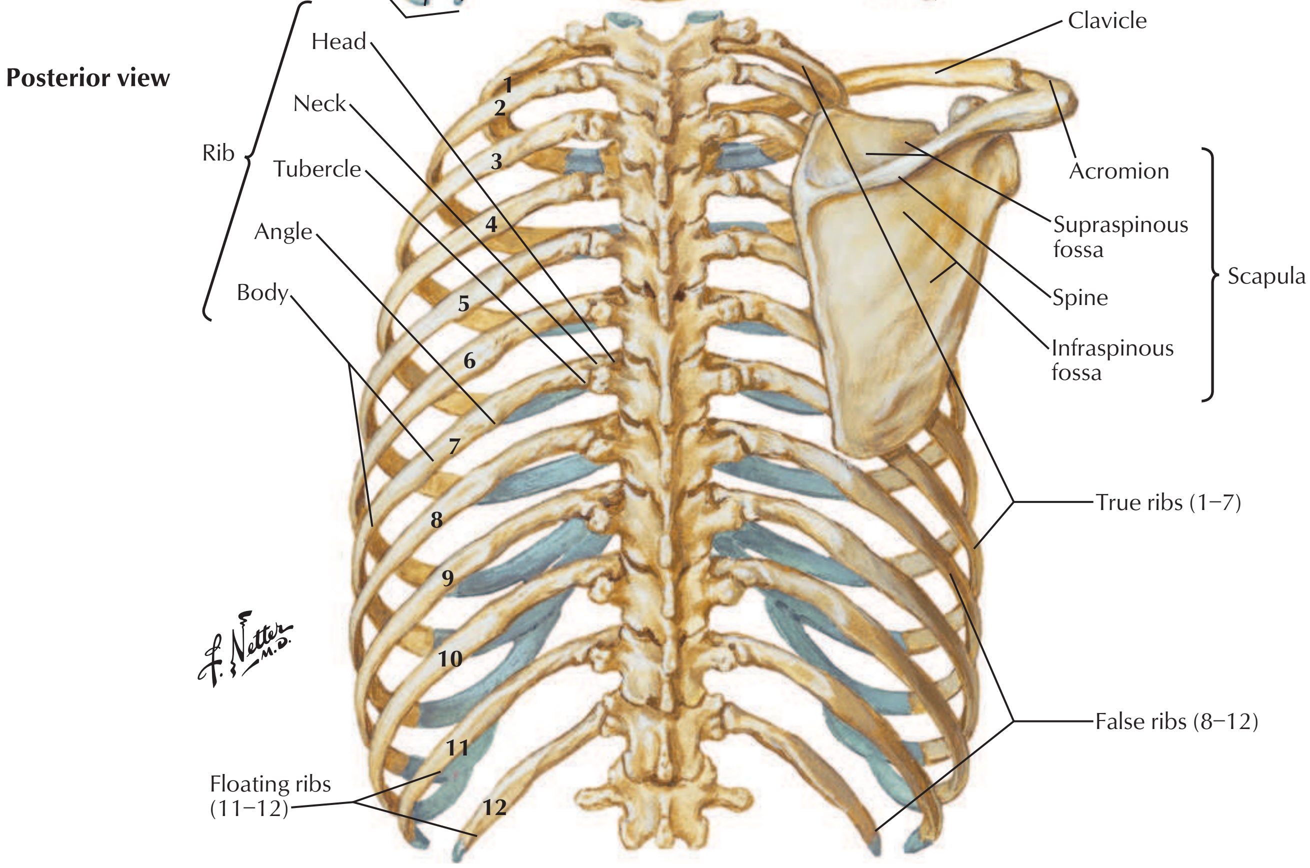
Bony Framework of Thorax

Anterior view

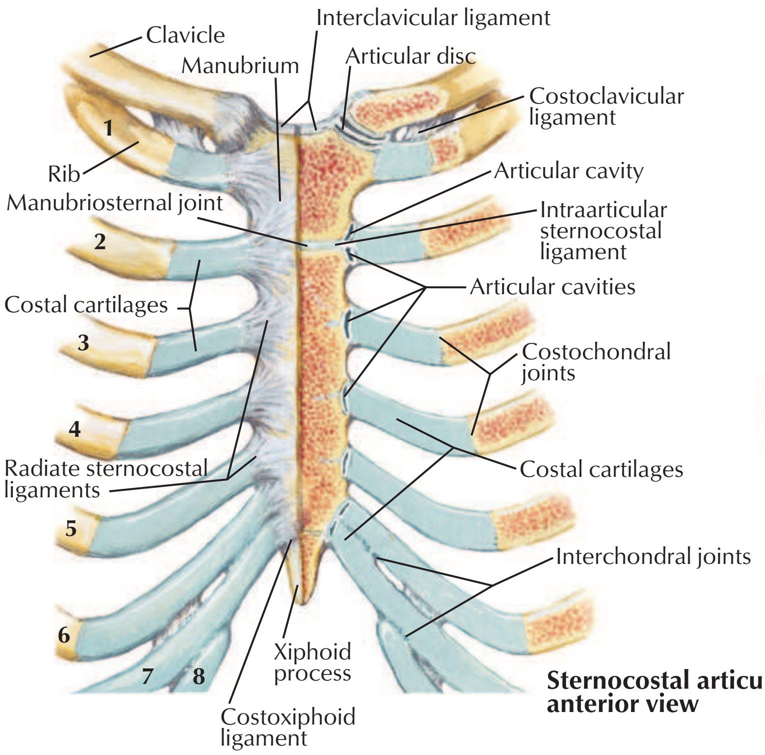


Jugular notch
Manubrium
Angle
Body
Xiphoid process
Sternum
Scapula
Acromion
Coracoid process
Glenoid fossa (cavity)
Neck
Superior scapular (suprascapular) notch
Subscapular fossa
Clavicle
True ribs (1–7)
Costal cartilages
False ribs (8–12)
Floating ribs (11–12)
1
2
3
4
5
6
7
8
9
10
11
12

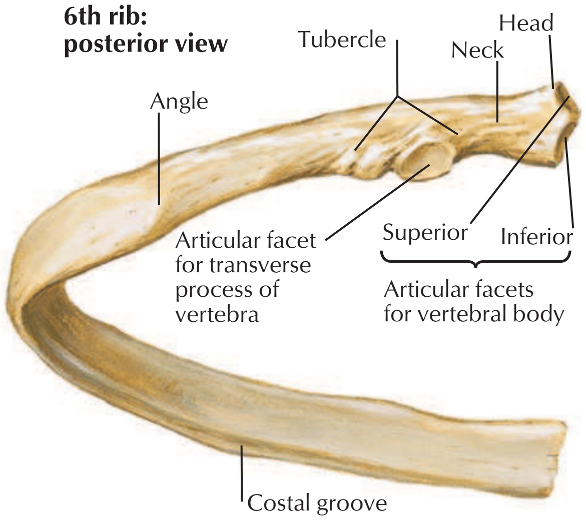
Posterior view



Rib
Head
Neck
Tubercle
Angle
Body
Clavicle
Acromion
Supraspinous fossa
Spine
Infraspinous fossa
Scapula
True ribs (1–7)
False ribs (8–12)
Floating ribs (11–12)
1
2
3
4
5
6
7
8
9
10
11
12

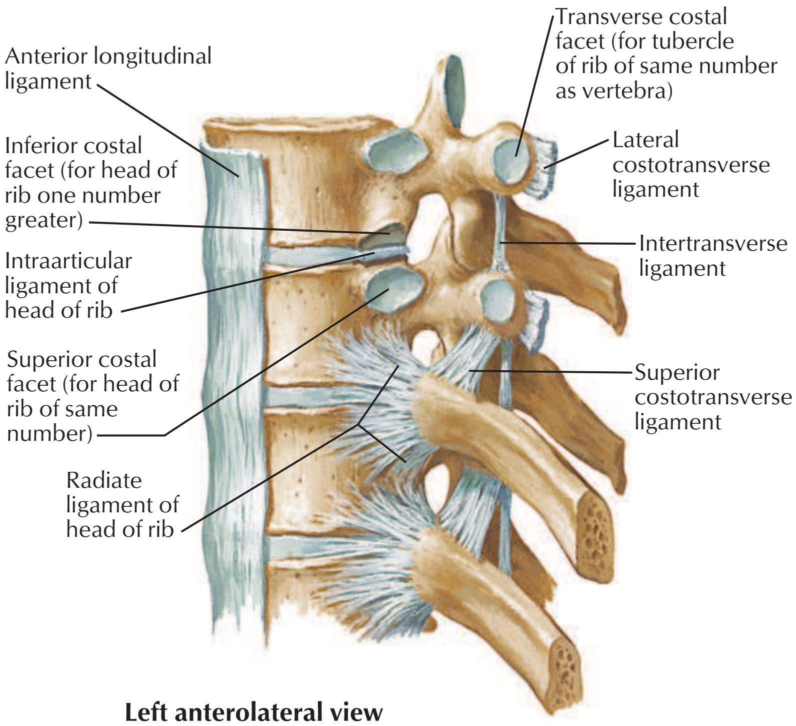

Clavicle
Manubrium
Interclavicular ligament
Articular disc
Costoclavicular ligament
1
Rib
Manubriosternal joint
Articular cavity
Intraarticular sternocostal ligament
2
Articular cavities
Costal cartilages
3
Costochondral joints
4
Radiate sternocostal ligaments
Costal cartilages
5
Interchondral joints
6
7
8
Xiphoid process
Costoxiphoid ligament

Sternocostal articulations: anterior view

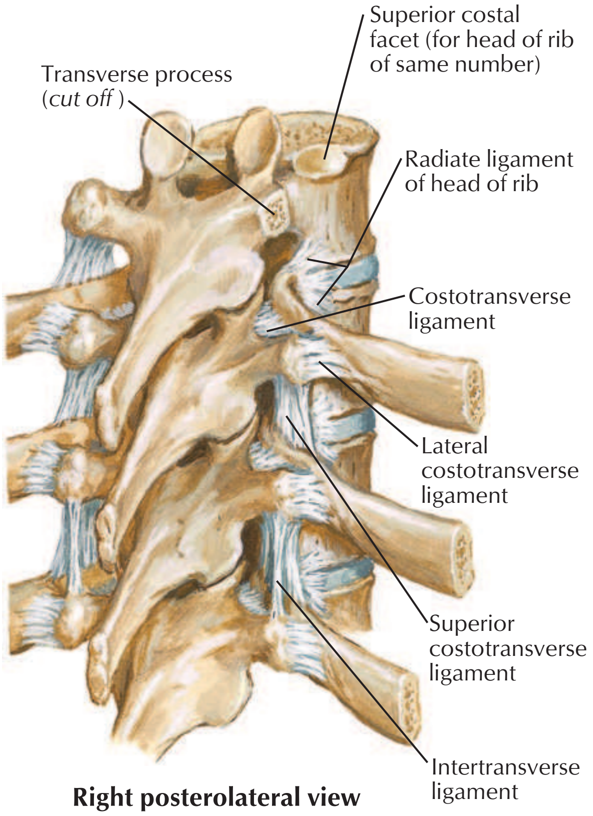

6th rib: posterior view

Tubercle
Head
Neck
Angle
Articular facet for transverse process of vertebra
Superior
Inferior
Articular facets for vertebral body
Costal groove

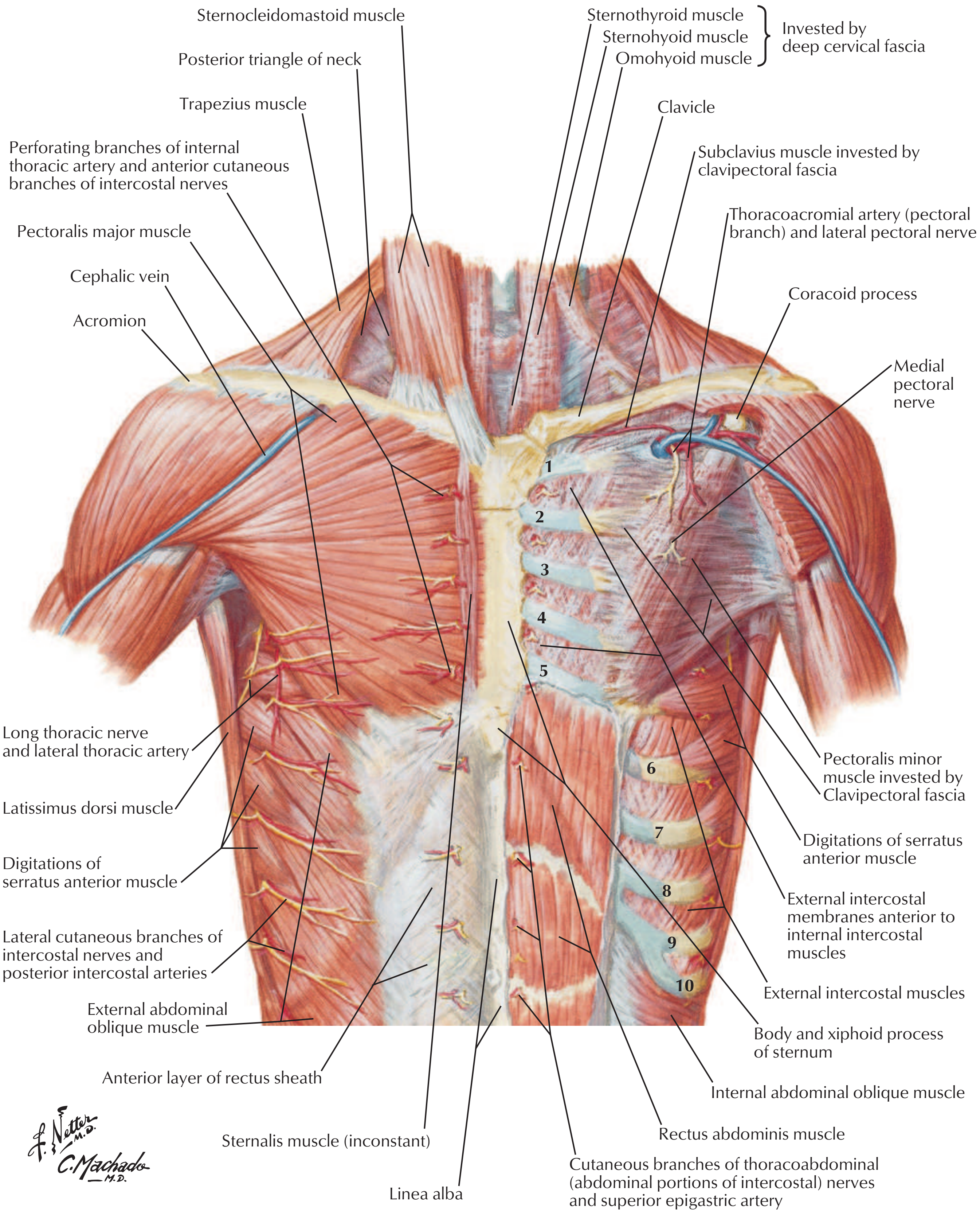
Note: The head of a typical rib articulates with the superior costal facet of the thoracic vertebra of the same number (by its inferior articular facet), the inferior costal facet of the vertebra above (by its superior articular facet), and the intervertebral disc between the two vertebrae. The costal tubercle articulates with the transverse process of the vertebra of the same number.

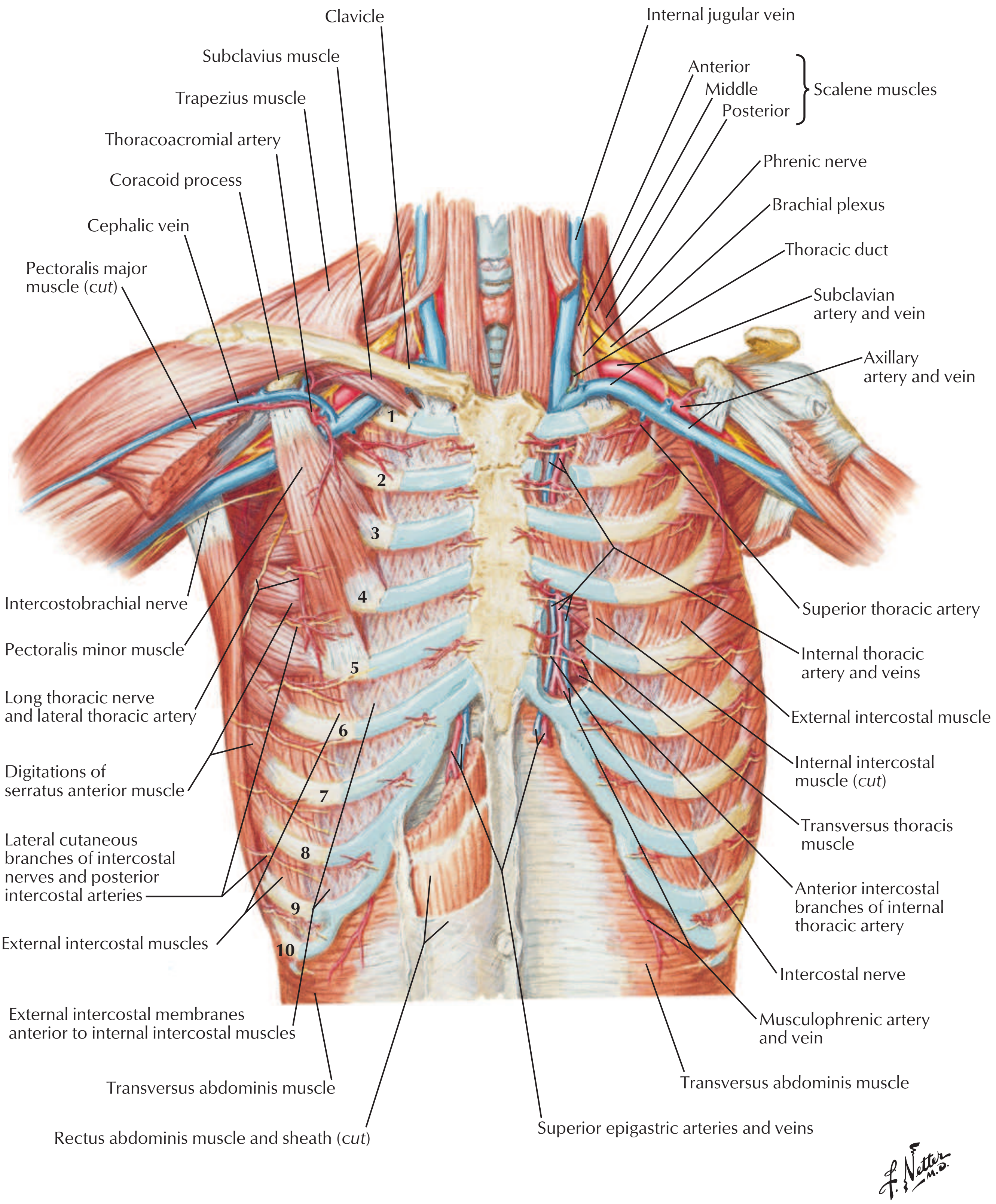

Anterior longitudinal ligament
Transverse costal facet (for tubercle of rib of same number as vertebra)
Inferior costal facet (for head of rib one number greater)
Lateral costotransverse ligament
Intraarticular ligament of head of rib
Intertransverse ligament
Superior costal facet (for head of rib of same number)
Superior costotransverse ligament
Radiate ligament of head of rib

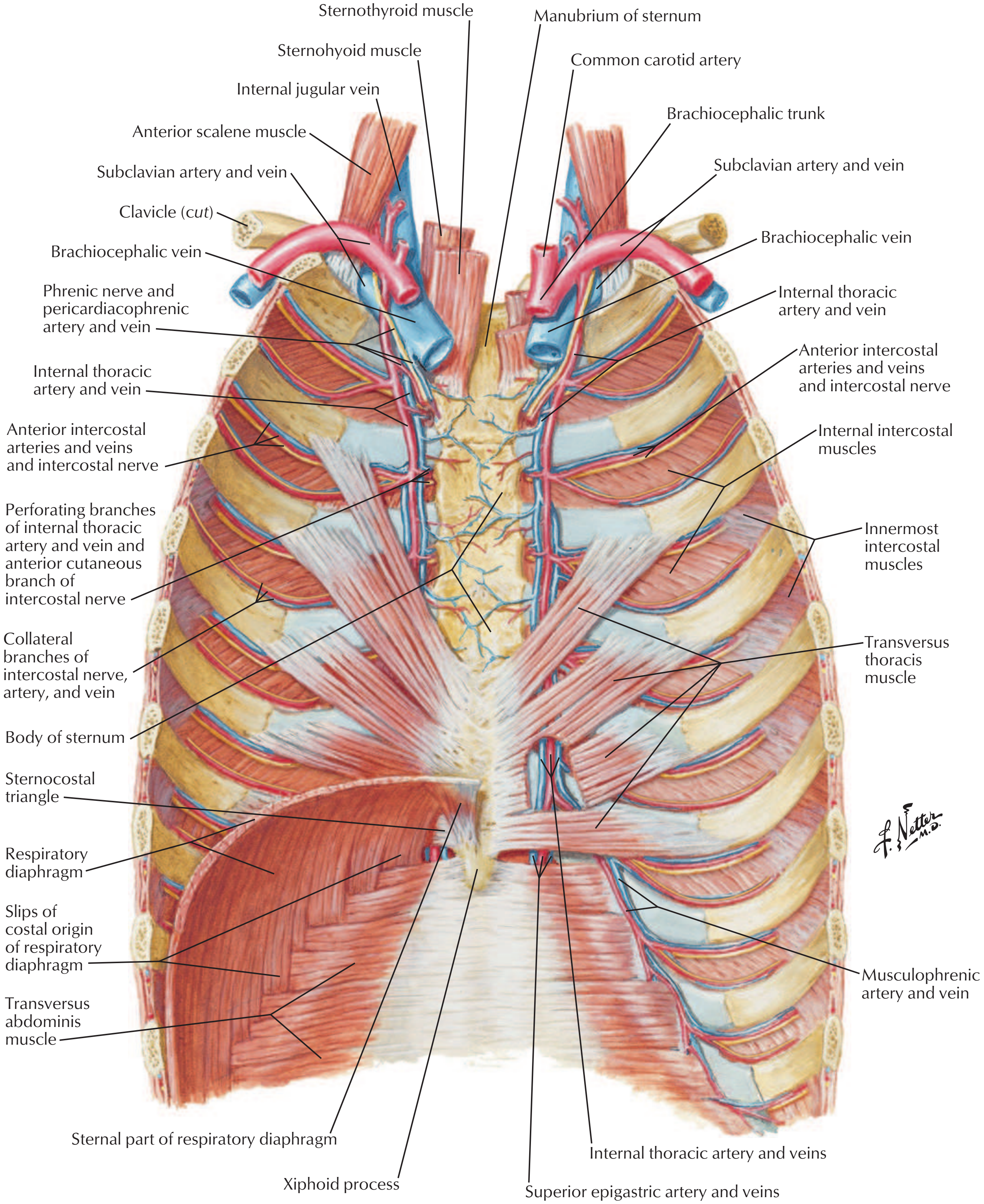
Left anterolateral view


Superior costal facet (for head of rib of same number)
Transverse process (*cut off*)
Radiate ligament of head of rib
Costotransverse ligament
Lateral costotransverse ligament
Superior costotransverse ligament
Intertransverse ligament

Right posterolateral view

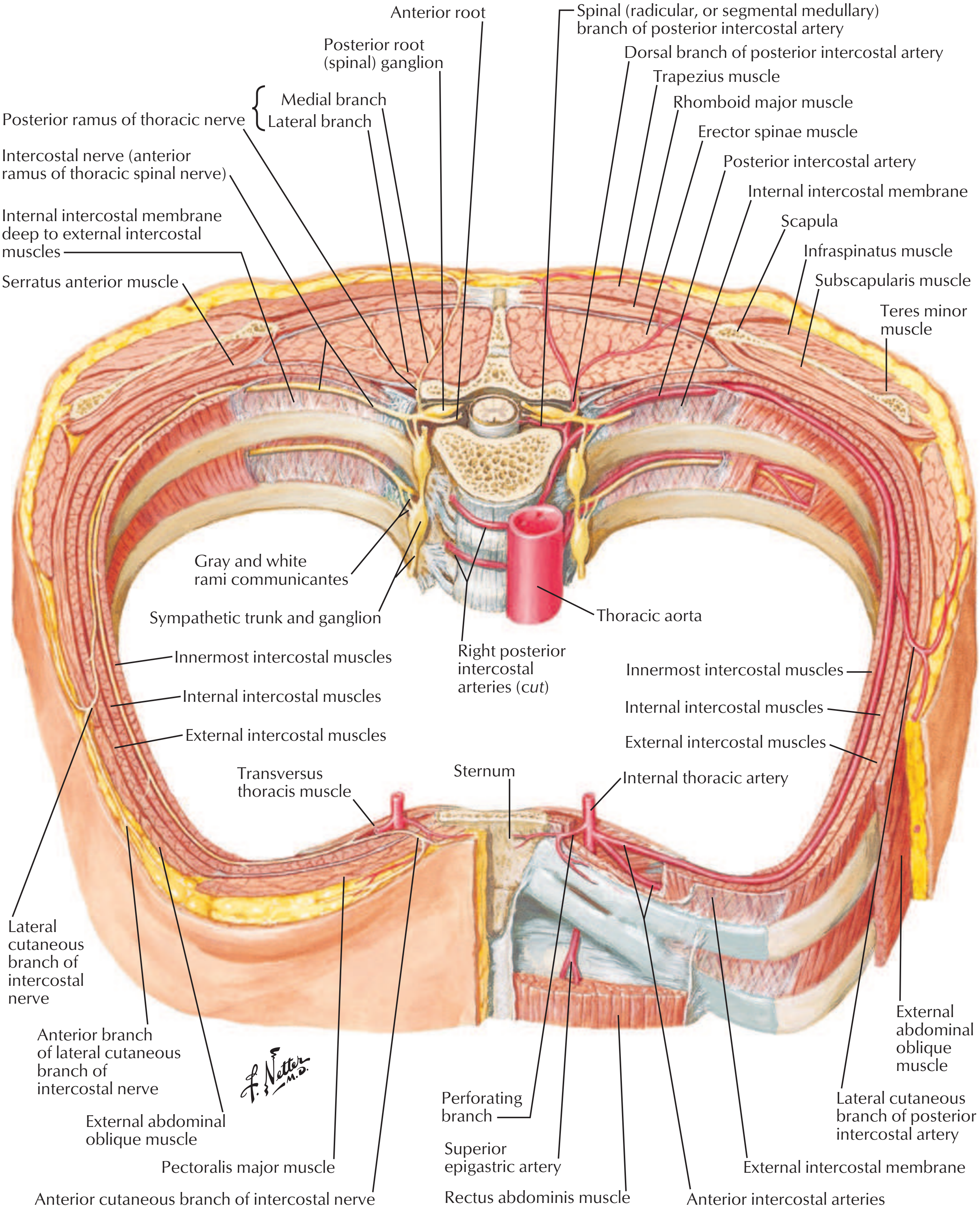

Sternocleidomastoid muscle
Posterior triangle of neck
Trapezius muscle
Perforating branches of internal thoracic artery and anterior cutaneous branches of intercostal nerves
Pectoralis major muscle
Cephalic vein
Acromion
Sternothyroid muscle
Sternohyoid muscle
Omohyoid muscle
Invested by deep cervical fascia
Clavicle
Subclavius muscle invested by clavipectoral fascia
Thoracoacromial artery (pectoral branch) and lateral pectoral nerve
Coracoid process
Medial pectoral nerve
1
2
3
4
5
6
7
8
9
10
Long thoracic nerve and lateral thoracic artery
Latissimus dorsi muscle
Digitations of serratus anterior muscle
Lateral cutaneous branches of intercostal nerves and posterior intercostal arteries
External abdominal oblique muscle
Anterior layer of rectus sheath
Sternalis muscle (inconstant)
Linea alba
Pectoralis minor muscle invested by Clavipectoral fascia
Digitations of serratus anterior muscle
External intercostal membranes anterior to internal intercostal muscles
External intercostal muscles
Body and xiphoid process of sternum
Internal abdominal oblique muscle
Rectus abdominis muscle
Cutaneous branches of thoracoabdominal (abdominal portions of intercostal) nerves and superior epigastric artery
F. Netter M.D.
C. Machado M.D.


Clavicle
Subclavius muscle
Trapezius muscle
Thoracoacromial artery
Coracoid process
Cephalic vein
Pectoralis major muscle (*cut*)
Intercostobrachial nerve
Pectoralis minor muscle
Long thoracic nerve and lateral thoracic artery
Digitations of serratus anterior muscle
Lateral cutaneous branches of intercostal nerves and posterior intercostal arteries
External intercostal muscles
External intercostal membranes anterior to internal intercostal muscles
Transversus abdominis muscle
Rectus abdominis muscle and sheath (*cut*)
Internal jugular vein
Anterior
Middle
Posterior
Scalene muscles
Phrenic nerve
Brachial plexus
Thoracic duct
Subclavian artery and vein
Axillary artery and vein
Superior thoracic artery
Internal thoracic artery and veins
External intercostal muscle
Internal intercostal muscle (*cut*)
Transversus thoracis muscle
Anterior intercostal branches of internal thoracic artery
Intercostal nerve
Musculophrenic artery and vein
Transversus abdominis muscle
Superior epigastric arteries and veins
1
2
3
4
5
6
7
8
9
10
F. Netter M.D.


Sternothyroid muscle
Manubrium of sternum
Sternohyoid muscle
Common carotid artery
Internal jugular vein
Brachiocephalic trunk
Anterior scalene muscle
Subclavian artery and vein
Subclavian artery and vein
Clavicle (*cut*)
Brachiocephalic vein
Brachiocephalic vein
Internal thoracic artery and vein
Phrenic nerve and pericardiacophrenic artery and vein
Anterior intercostal arteries and veins and intercostal nerve
Internal thoracic artery and vein
Internal intercostal muscles
Anterior intercostal arteries and veins and intercostal nerve
Perforating branches of internal thoracic artery and vein and anterior cutaneous branch of intercostal nerve
Innermost intercostal muscles
Collateral branches of intercostal nerve, artery, and vein
Transversus thoracis muscle
Body of sternum
Sternocostal triangle
Respiratory diaphragm
Slips of costal origin of respiratory diaphragm
Musculophrenic artery and vein
Transversus abdominis muscle
Sternal part of respiratory diaphragm
Internal thoracic artery and veins
Xiphoid process
Superior epigastric artery and veins

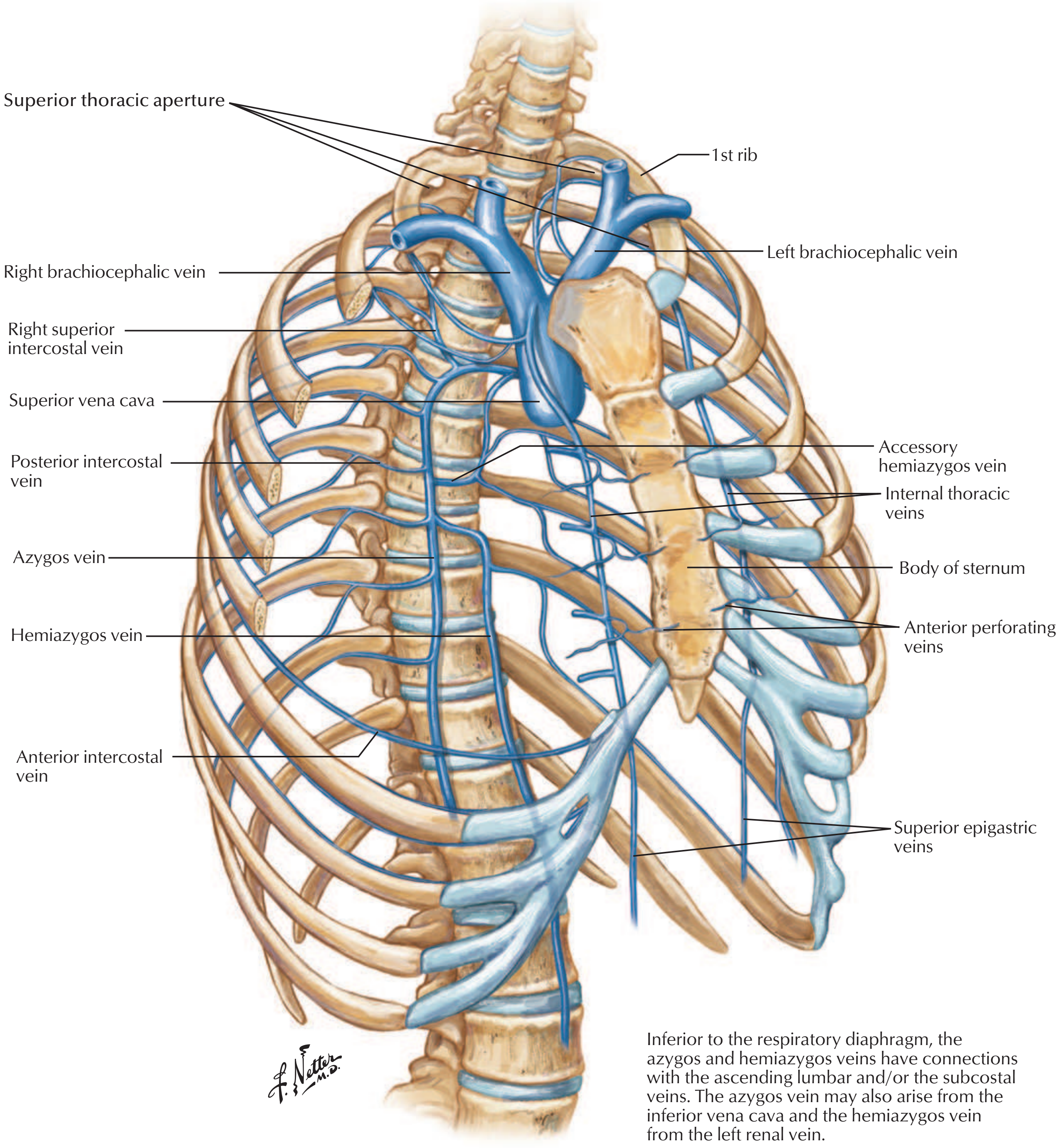
Intercostal Nerves and Arteries

See also Plates 261, 269


Anterior root
Spinal (radicular, or segmental medullary) branch of posterior intercostal artery
Posterior root (spinal) ganglion
Dorsal branch of posterior intercostal artery
Trapezius muscle
Medial branch
Lateral branch
Posterior ramus of thoracic nerve
Rhomboid major muscle
Erector spinae muscle
Intercostal nerve (anterior ramus of thoracic spinal nerve)
Posterior intercostal artery
Internal intercostal membrane
Internal intercostal membrane deep to external intercostal muscles
Scapula
Infraspinatus muscle
Serratus anterior muscle
Subscapularis muscle
Teres minor muscle
Gray and white rami communicantes
Sympathetic trunk and ganglion
Thoracic aorta
Innermost intercostal muscles
Right posterior intercostal arteries (cut)
Innermost intercostal muscles
Internal intercostal muscles
Internal intercostal muscles
External intercostal muscles
External intercostal muscles
Transversus thoracis muscle
Sternum
Internal thoracic artery
Lateral cutaneous branch of intercostal nerve
External abdominal oblique muscle
Anterior branch of lateral cutaneous branch of intercostal nerve
F. Netter M.D.
Lateral cutaneous branch of posterior intercostal artery
Perforating branch
External abdominal oblique muscle
Superior epigastric artery
Pectoralis major muscle
External intercostal membrane
Anterior cutaneous branch of intercostal nerve
Rectus abdominis muscle
Anterior intercostal arteries

Veins of Internal Thoracic Wall

See also **Plates 234, 241, 259**

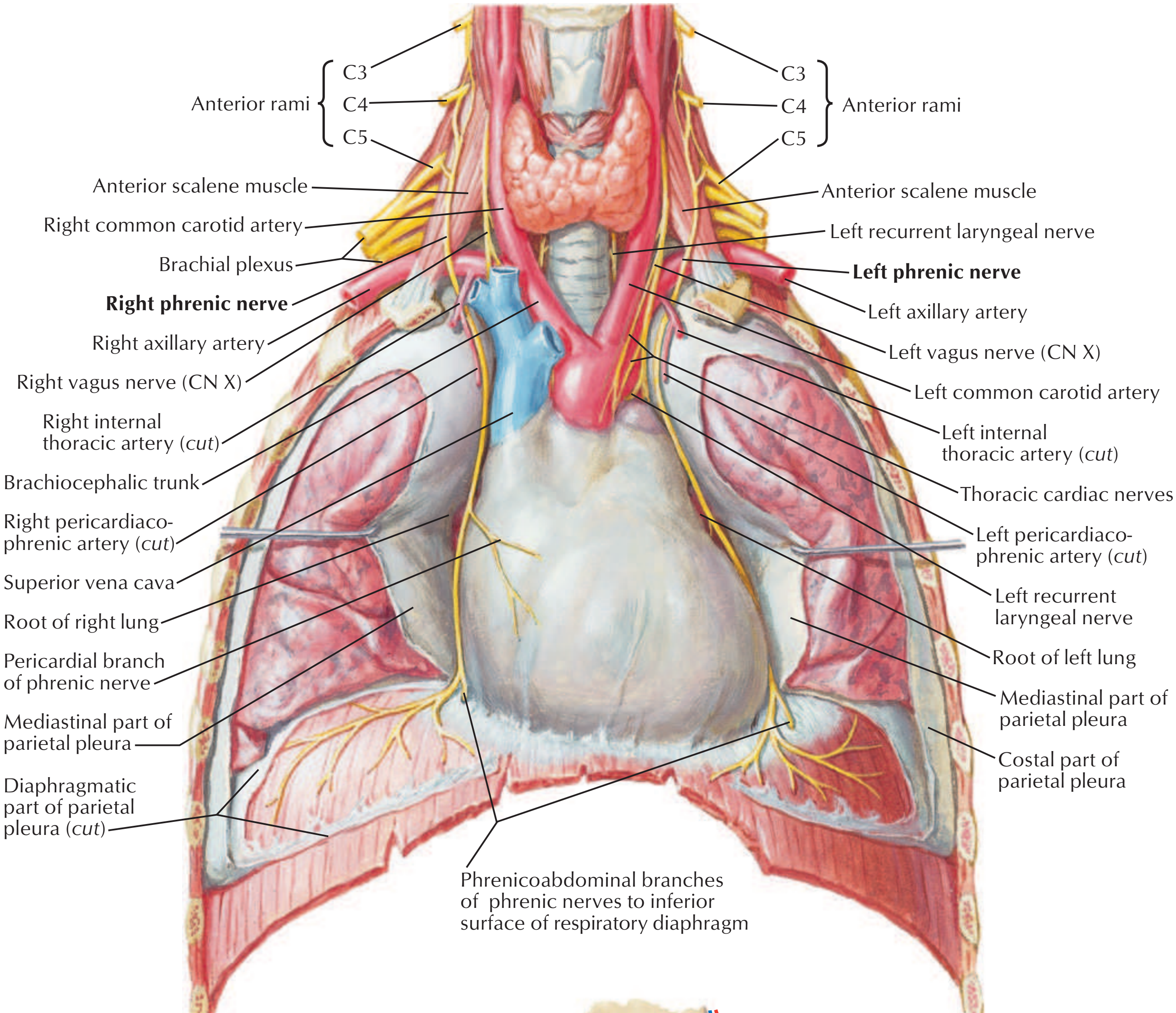


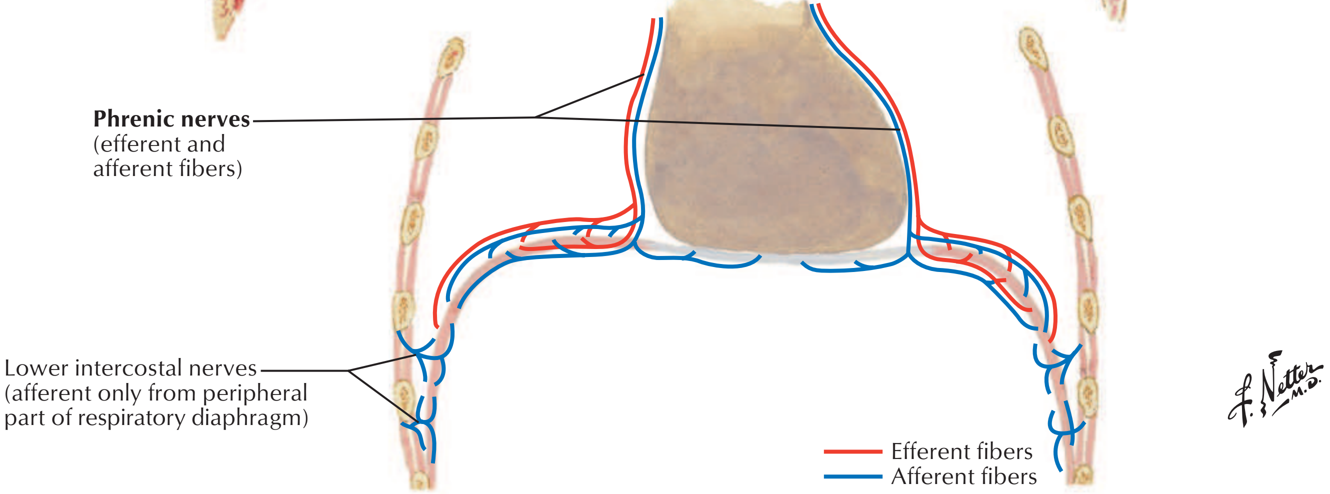
Superior thoracic aperture
1st rib
Left brachiocephalic vein
Right brachiocephalic vein
Right superior intercostal vein
Superior vena cava
Accessory hemiazygos vein
Posterior intercostal vein
Internal thoracic veins
Azygos vein
Body of sternum
Hemiazygos vein
Anterior perforating veins
Anterior intercostal vein
Superior epigastric veins

Inferior to the respiratory diaphragm, the azygos and hemiazygos veins have connections with the ascending lumbar and/or the subcostal veins. The azygos vein may also arise from the inferior vena cava and the hemiazygos vein from the left renal vein.

Phrenic Nerve

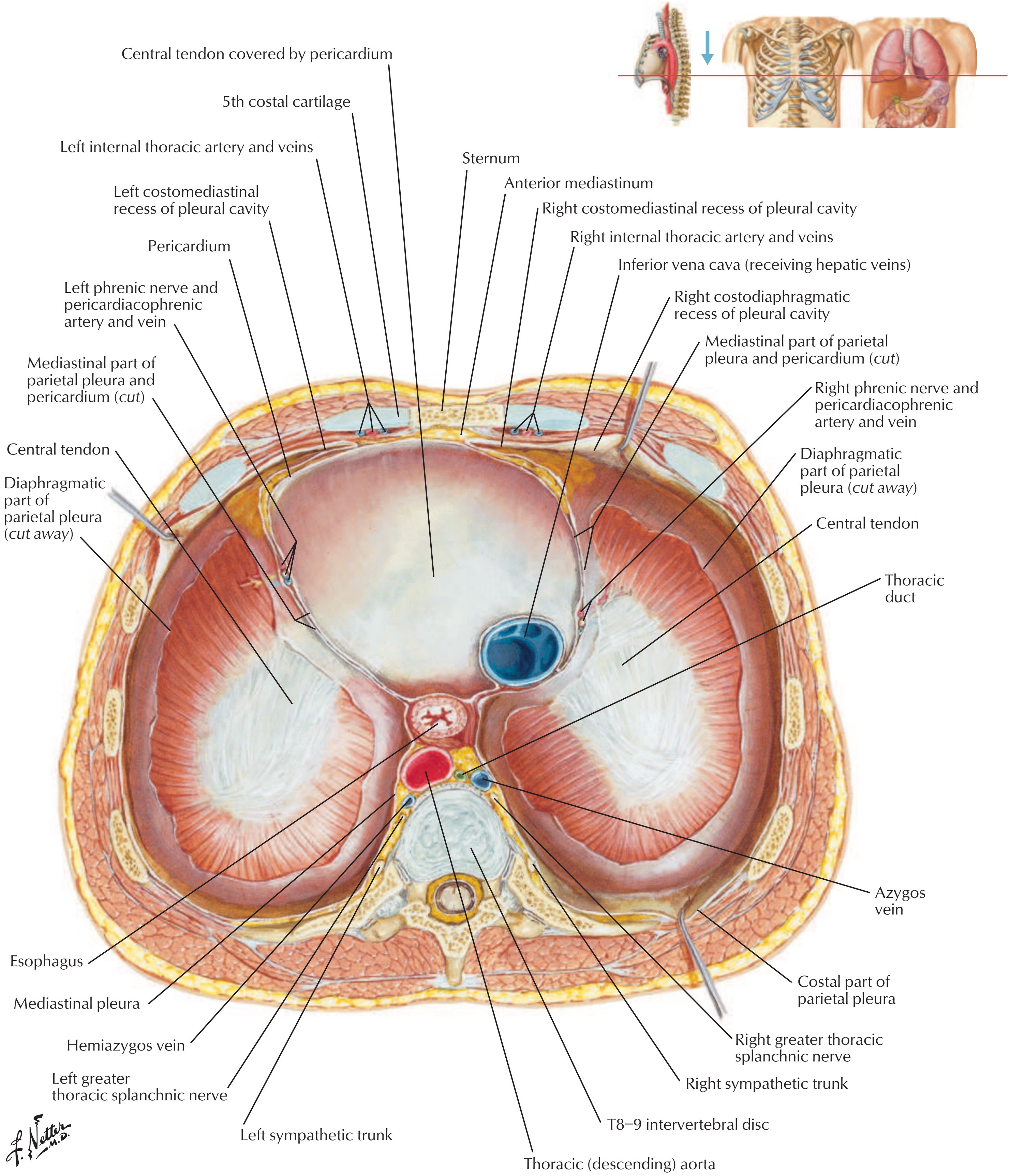
See also Plates 39, 87


Anterior rami
C3
C4
C5
C3
C4
C5
Anterior rami
Anterior scalene muscle
Right common carotid artery
Brachial plexus
Right phrenic nerve
Right axillary artery
Right vagus nerve (CN X)
Right internal thoracic artery (*cut*)
Brachiocephalic trunk
Right pericardiacophrenic artery (*cut*)
Superior vena cava
Root of right lung
Pericardial branch of phrenic nerve
Mediastinal part of parietal pleura
Diaphragmatic part of parietal pleura (*cut*)
Anterior scalene muscle
Left recurrent laryngeal nerve
Left phrenic nerve
Left axillary artery
Left vagus nerve (CN X)
Left common carotid artery
Left internal thoracic artery (*cut*)
Thoracic cardiac nerves
Left pericardiacophrenic artery (*cut*)
Left recurrent laryngeal nerve
Root of left lung
Mediastinal part of parietal pleura
Costal part of parietal pleura
Phrenicoabdominal branches of phrenic nerves to inferior surface of respiratory diaphragm


Phrenic nerves (efferent and afferent fibers)
Lower intercostal nerves (afferent only from peripheral part of respiratory diaphragm)
Efferent fibers
Afferent fibers

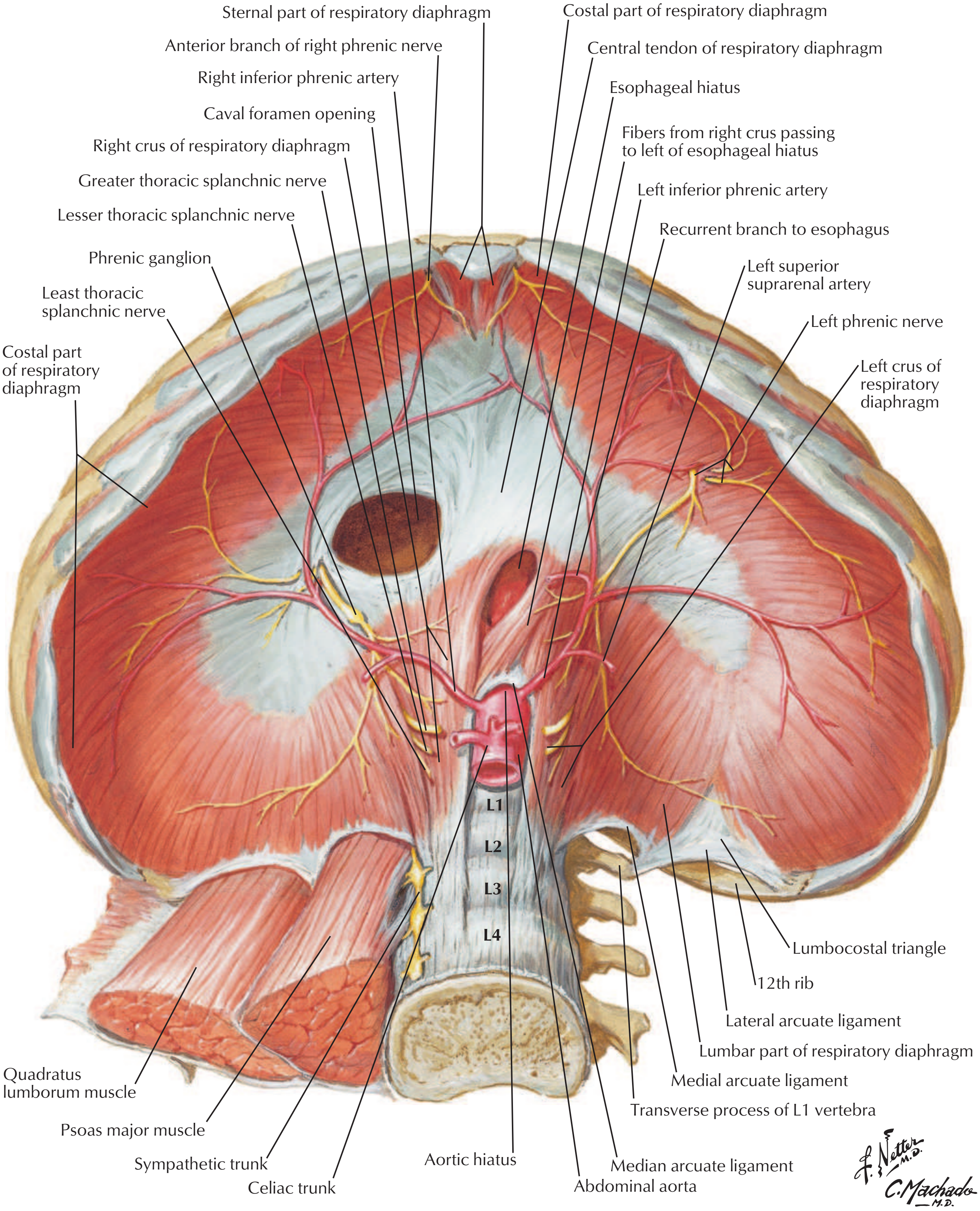
Respiratory Diaphragm: Thoracic Surface

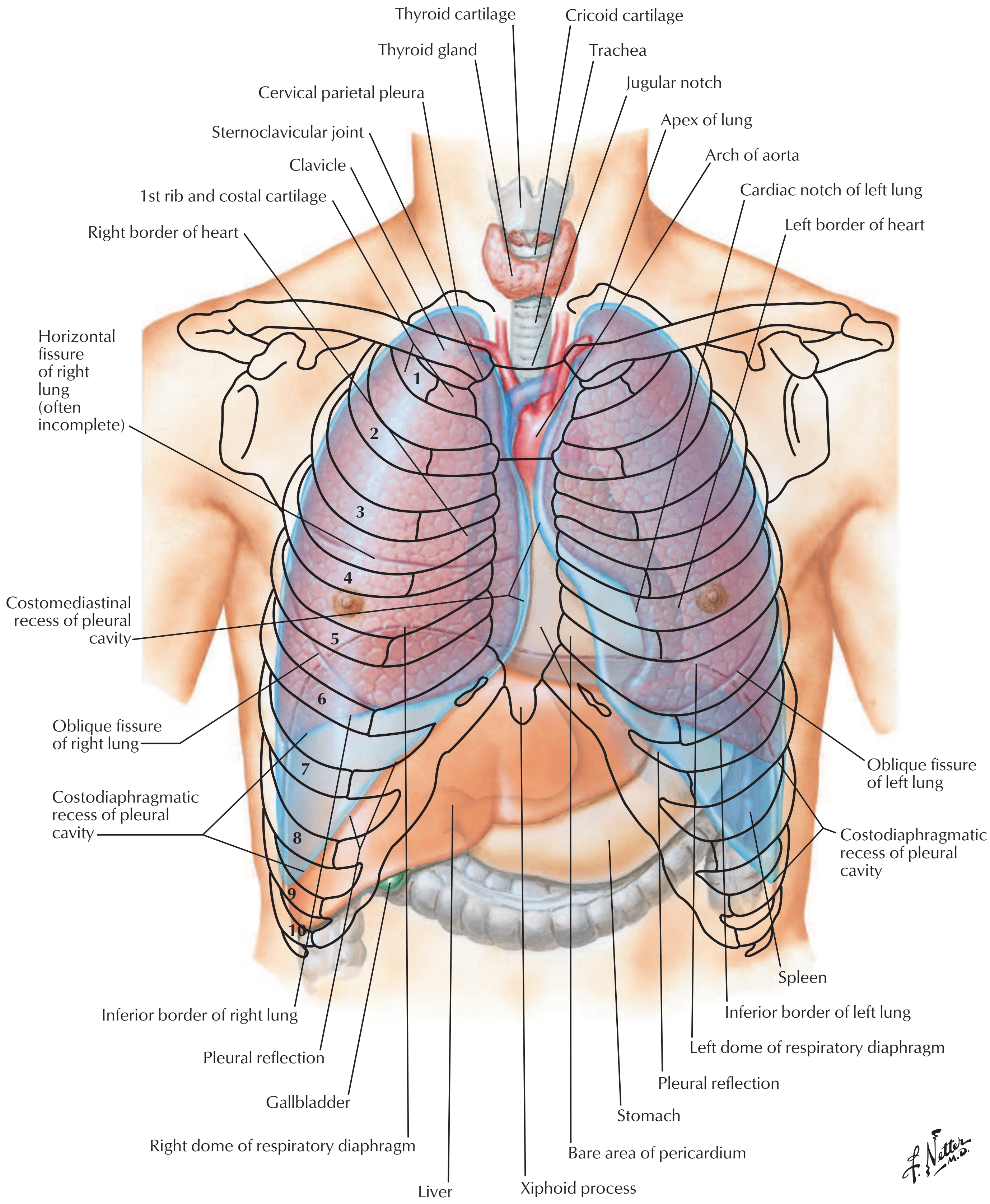
See also **Plate 236**

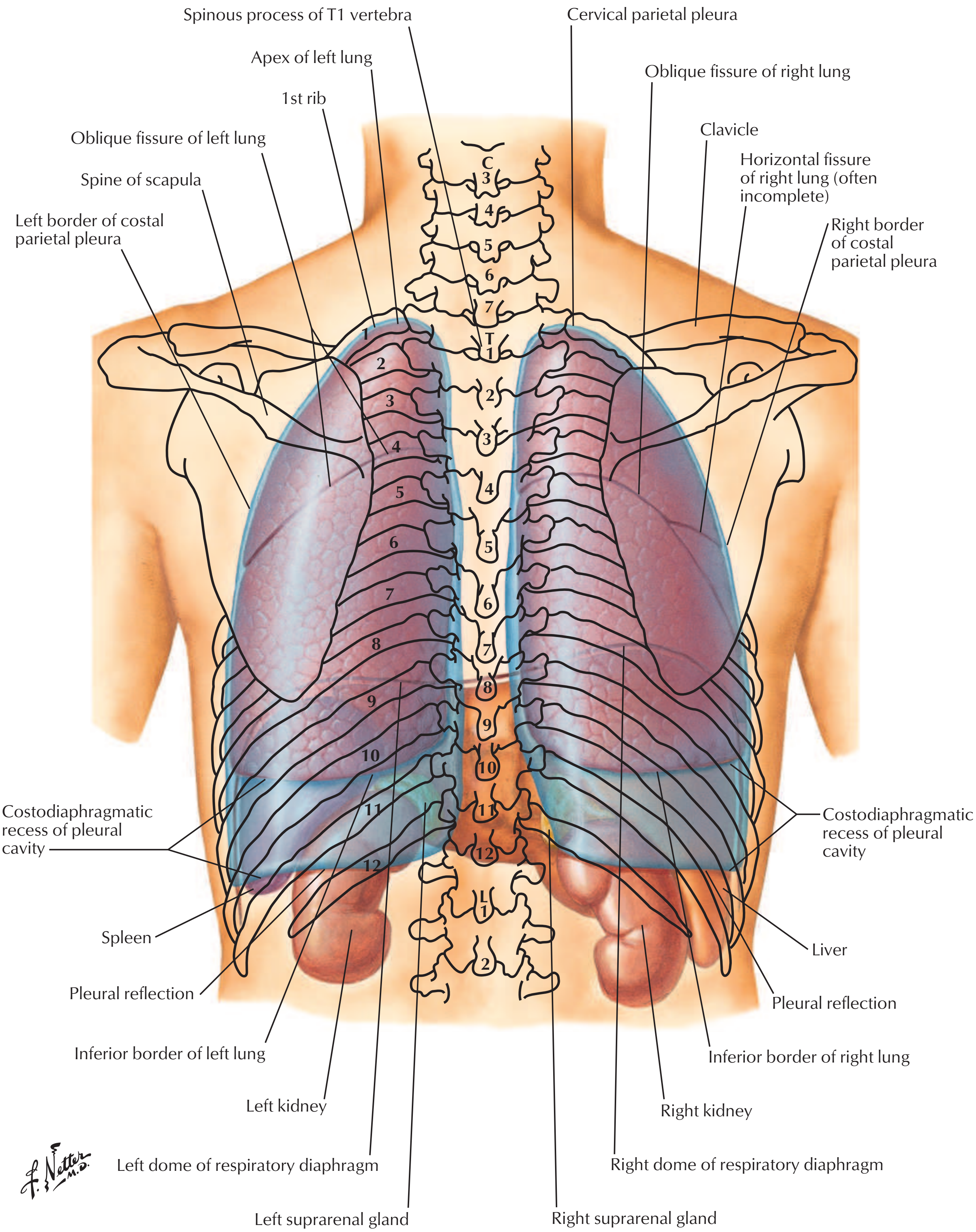

Central tendon covered by pericardium
5th costal cartilage
Left internal thoracic artery and veins
Left costomediastinal recess of pleural cavity
Pericardium
Left phrenic nerve and pericardiacophrenic artery and vein
Mediastinal part of parietal pleura and pericardium (*cut*)
Central tendon
Diaphragmatic part of parietal pleura (*cut away*)
Sternum
Anterior mediastinum
Right costomediastinal recess of pleural cavity
Right internal thoracic artery and veins
Inferior vena cava (receiving hepatic veins)
Right costodiaphragmatic recess of pleural cavity
Mediastinal part of parietal pleura and pericardium (*cut*)
Right phrenic nerve and pericardiacophrenic artery and vein
Diaphragmatic part of parietal pleura (*cut away*)
Central tendon
Thoracic duct
Azygos vein
Costal part of parietal pleura
Right greater thoracic splanchnic nerve
Right sympathetic trunk
T8–9 intervertebral disc
Thoracic (descending) aorta
Left sympathetic trunk
Left greater thoracic splanchnic nerve
Hemiazygos vein
Mediastinal pleura
Esophagus
F. Netter M.D.

Respiratory Diaphragm: Abdominal Surface

See also Plates 265, 266


Sternal part of respiratory diaphragm
Anterior branch of right phrenic nerve
Right inferior phrenic artery
Caval foramen opening
Right crus of respiratory diaphragm
Greater thoracic splanchnic nerve
Lesser thoracic splanchnic nerve
Phrenic ganglion
Least thoracic splanchnic nerve
Costal part of respiratory diaphragm
Costal part of respiratory diaphragm
Central tendon of respiratory diaphragm
Esophageal hiatus
Fibers from right crus passing to left of esophageal hiatus
Left inferior phrenic artery
Recurrent branch to esophagus
Left superior suprarenal artery
Left phrenic nerve
Left crus of respiratory diaphragm
L1
L2
L3
L4
Lumbocostal triangle
12th rib
Lateral arcuate ligament
Lumbar part of respiratory diaphragm
Medial arcuate ligament
Transverse process of L1 vertebra
Quadratus lumborum muscle
Psoas major muscle
Sympathetic trunk
Celiac trunk
Aortic hiatus
Median arcuate ligament
Abdominal aorta
F. Netter M.D.
C. Machado M.D.


Thyroid cartilage
Cricoid cartilage
Thyroid gland
Trachea
Cervical parietal pleura
Jugular notch
Sternoclavicular joint
Apex of lung
Clavicle
Arch of aorta
1st rib and costal cartilage
Cardiac notch of left lung
Right border of heart
Left border of heart
Horizontal fissure of right lung (often incomplete)
1
2
3
4
5
6
7
8
9
10
Costomediastinal recess of pleural cavity
Oblique fissure of right lung
Oblique fissure of left lung
Costodiaphragmatic recess of pleural cavity
Costodiaphragmatic recess of pleural cavity
Spleen
Inferior border of right lung
Inferior border of left lung
Left dome of respiratory diaphragm
Pleural reflection
Pleural reflection
Gallbladder
Stomach
Right dome of respiratory diaphragm
Bare area of pericardium
Liver
Xiphoid process


Spinous process of T1 vertebra
Cervical parietal pleura
Apex of left lung
Oblique fissure of right lung
1st rib
Clavicle
Oblique fissure of left lung
Horizontal fissure of right lung (often incomplete)
Spine of scapula
Left border of costal parietal pleura
Right border of costal parietal pleura
C
3
4
5
6
7
T
1
2
3
4
5
6
7
8
9
10
11
12
L
1
2
1
2
3
4
5
6
7
8
9
10
11
12
Costodiaphragmatic recess of pleural cavity
Costodiaphragmatic recess of pleural cavity
Spleen
Liver
Pleural reflection
Pleural reflection
Inferior border of left lung
Inferior border of right lung
Left kidney
Right kidney
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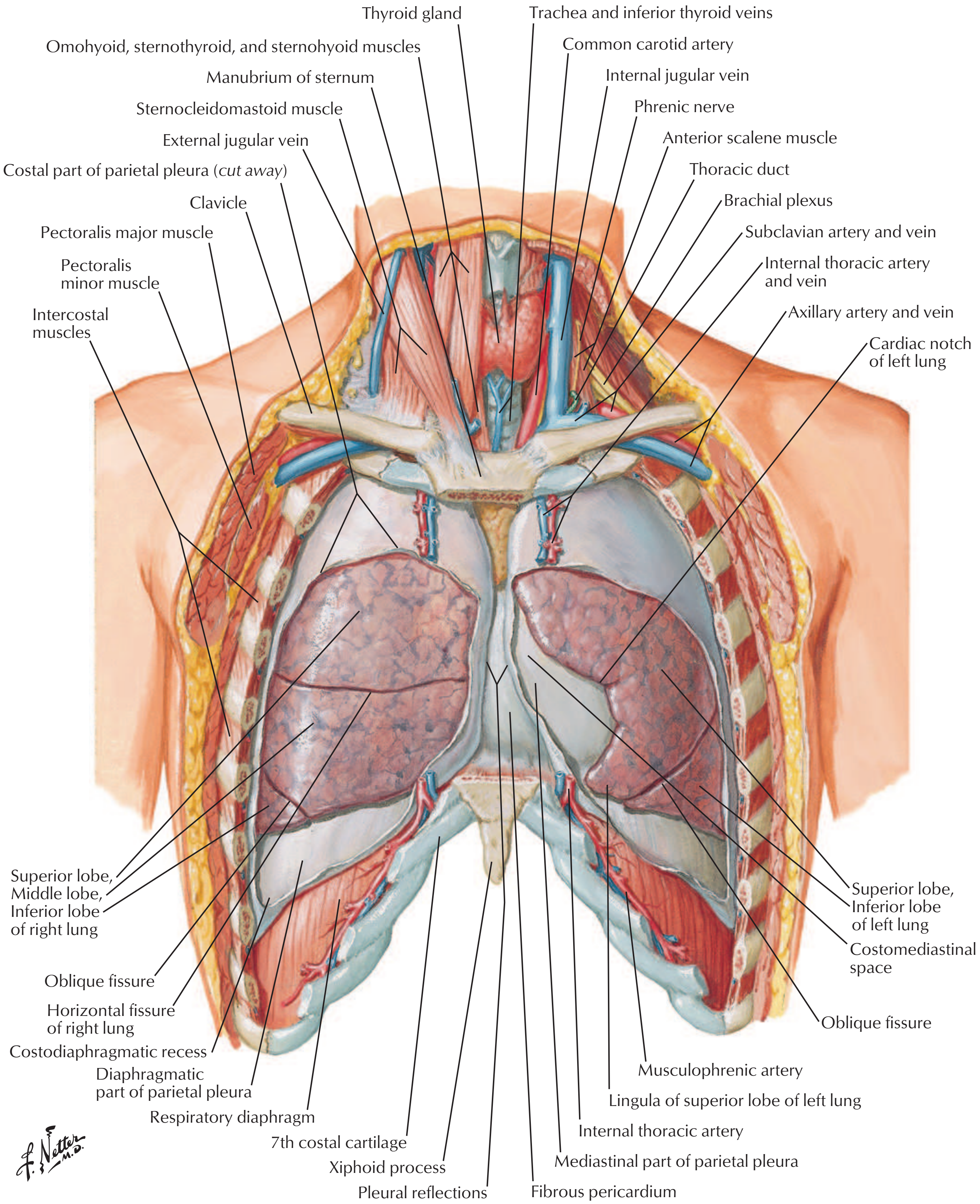
Left dome of respiratory diaphragm
Right dome of respiratory diaphragm
Left suprarenal gland
Right suprarenal gland

Lungs in Situ: Anterior View


Thyroid gland
Trachea and inferior thyroid veins
Omohyoid, sternothyroid, and sternohyoid muscles
Common carotid artery
Manubrium of sternum
Internal jugular vein
Sternocleidomastoid muscle
Phrenic nerve
External jugular vein
Anterior scalene muscle
Costal part of parietal pleura (cut away)
Thoracic duct
Clavicle
Brachial plexus
Pectoralis major muscle
Subclavian artery and vein
Pectoralis minor muscle
Internal thoracic artery and vein
Intercostal muscles
Axillary artery and vein
Cardiac notch of left lung
Superior lobe, Middle lobe, Inferior lobe of right lung
Superior lobe, Inferior lobe of left lung
Costomediastinal space
Oblique fissure
Horizontal fissure of right lung
Oblique fissure
Costodiaphragmatic recess
Diaphragmatic part of parietal pleura
Musculophrenic artery
Respiratory diaphragm
Lingula of superior lobe of left lung
7th costal cartilage
Internal thoracic artery
Xiphoid process
Mediastinal part of parietal pleura
Pleural reflections
Fibrous pericardium
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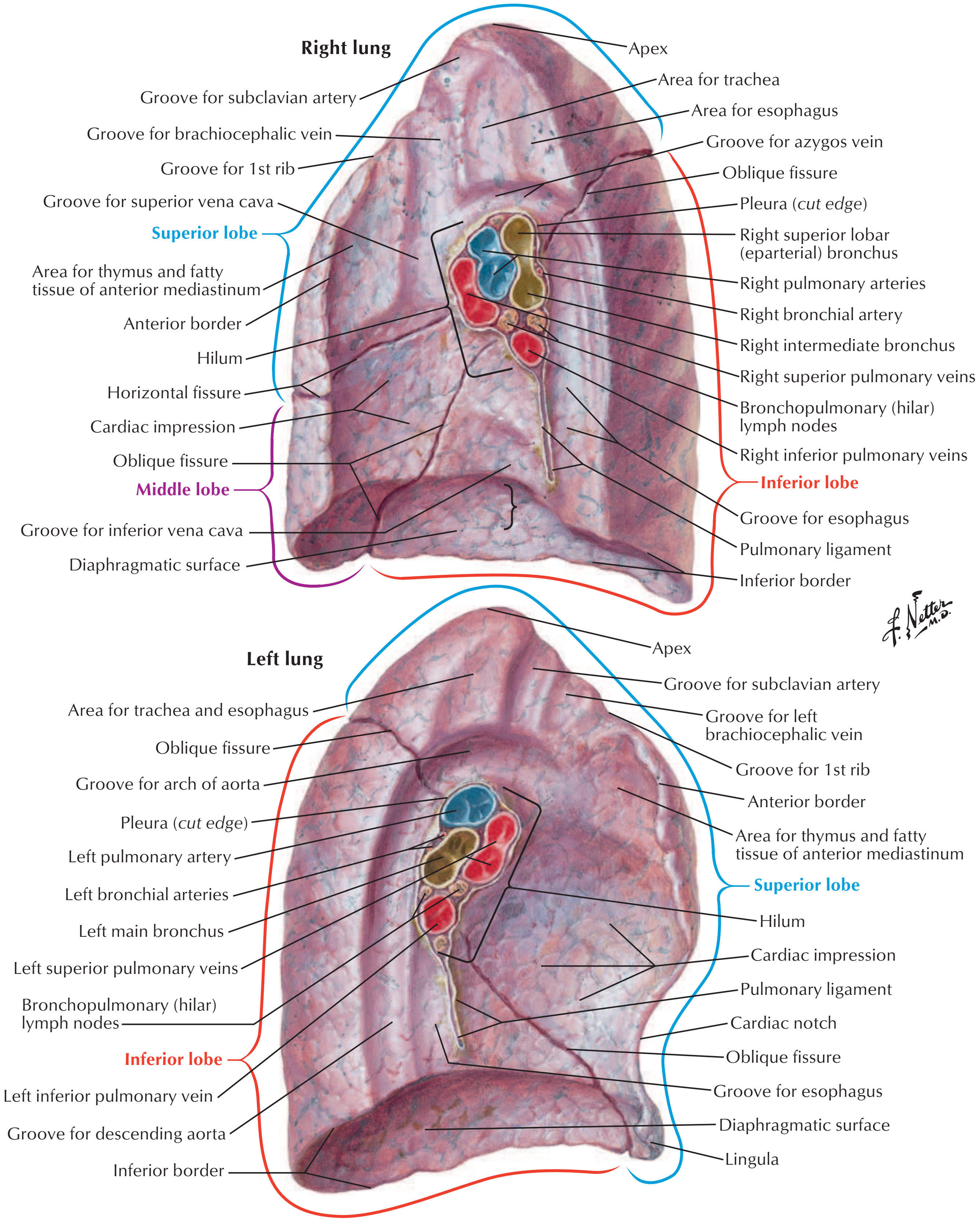
Right lung
Apex
Area for trachea
Area for esophagus
Groove for azygos vein
Oblique fissure
Pleura (cut edge)
Right superior lobar (eparterial) bronchus
Right pulmonary arteries
Right bronchial artery
Right intermediate bronchus
Right superior pulmonary veins
Bronchopulmonary (hilar) lymph nodes
Right inferior pulmonary veins
Inferior lobe
Groove for esophagus
Pulmonary ligament
Inferior border
Groove for subclavian artery
Groove for brachiocephalic vein
Groove for 1st rib
Groove for superior vena cava
Superior lobe
Area for thymus and fatty tissue of anterior mediastinum
Anterior border
Hilum
Horizontal fissure
Cardiac impression
Oblique fissure
Middle lobe
Groove for inferior vena cava
Diaphragmatic surface
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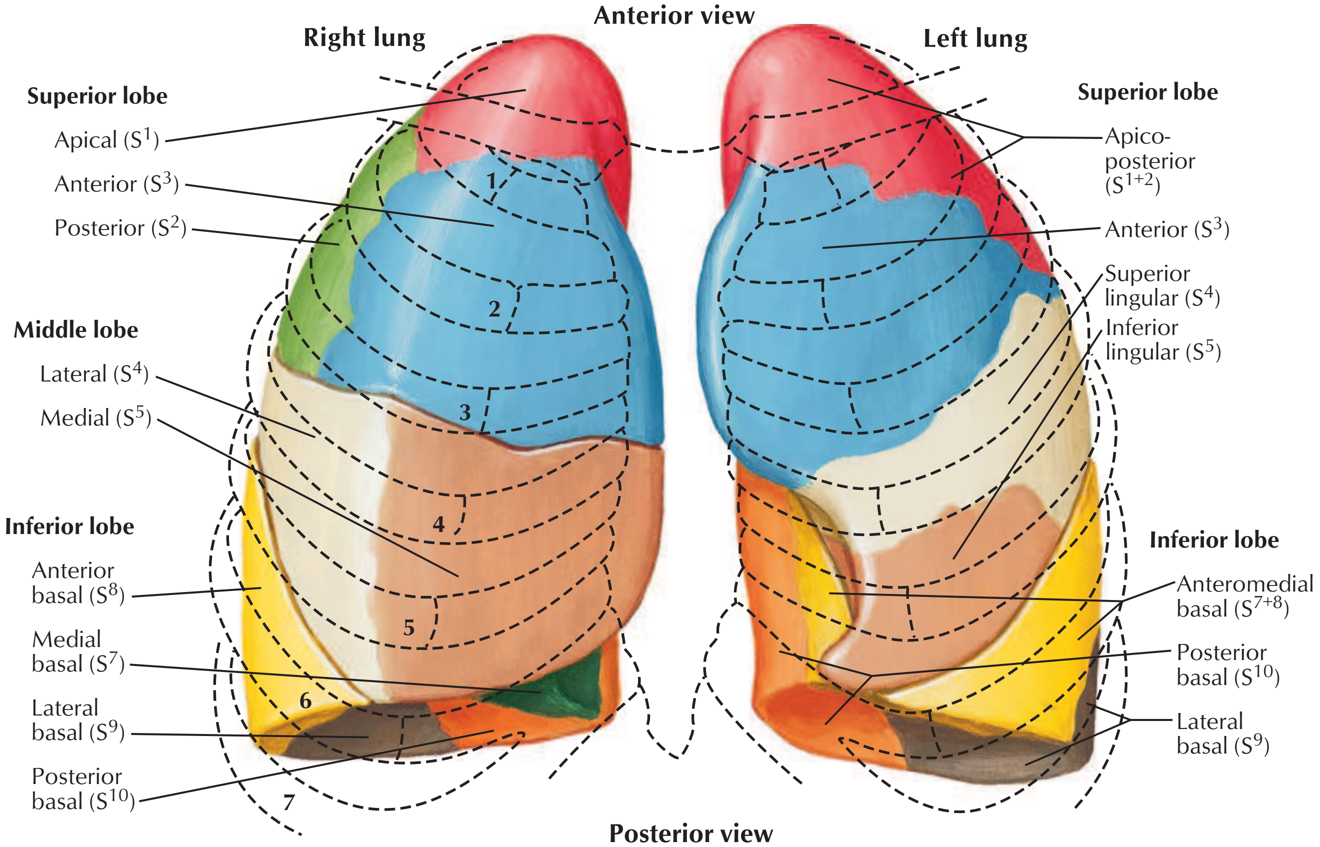
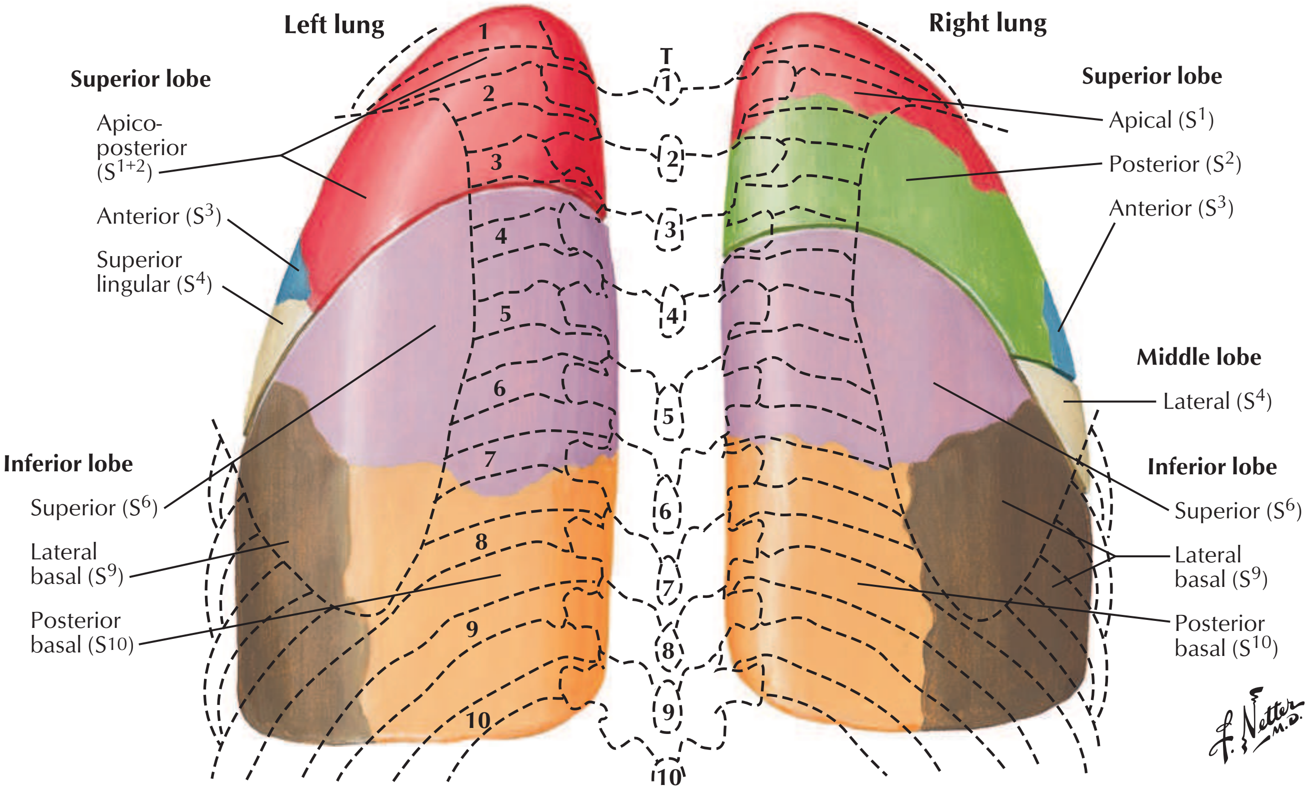
Left lung
Apex
Groove for subclavian artery
Groove for left brachiocephalic vein
Groove for 1st rib
Anterior border
Area for thymus and fatty tissue of anterior mediastinum
Superior lobe
Hilum
Cardiac impression
Pulmonary ligament
Cardiac notch
Oblique fissure
Groove for esophagus
Diaphragmatic surface
Lingula
Area for trachea and esophagus
Oblique fissure
Groove for arch of aorta
Pleura (cut edge)
Left pulmonary artery
Left bronchial arteries
Left main bronchus
Left superior pulmonary veins
Bronchopulmonary (hilar) lymph nodes
Inferior lobe
Left inferior pulmonary vein
Groove for descending aorta
Inferior border

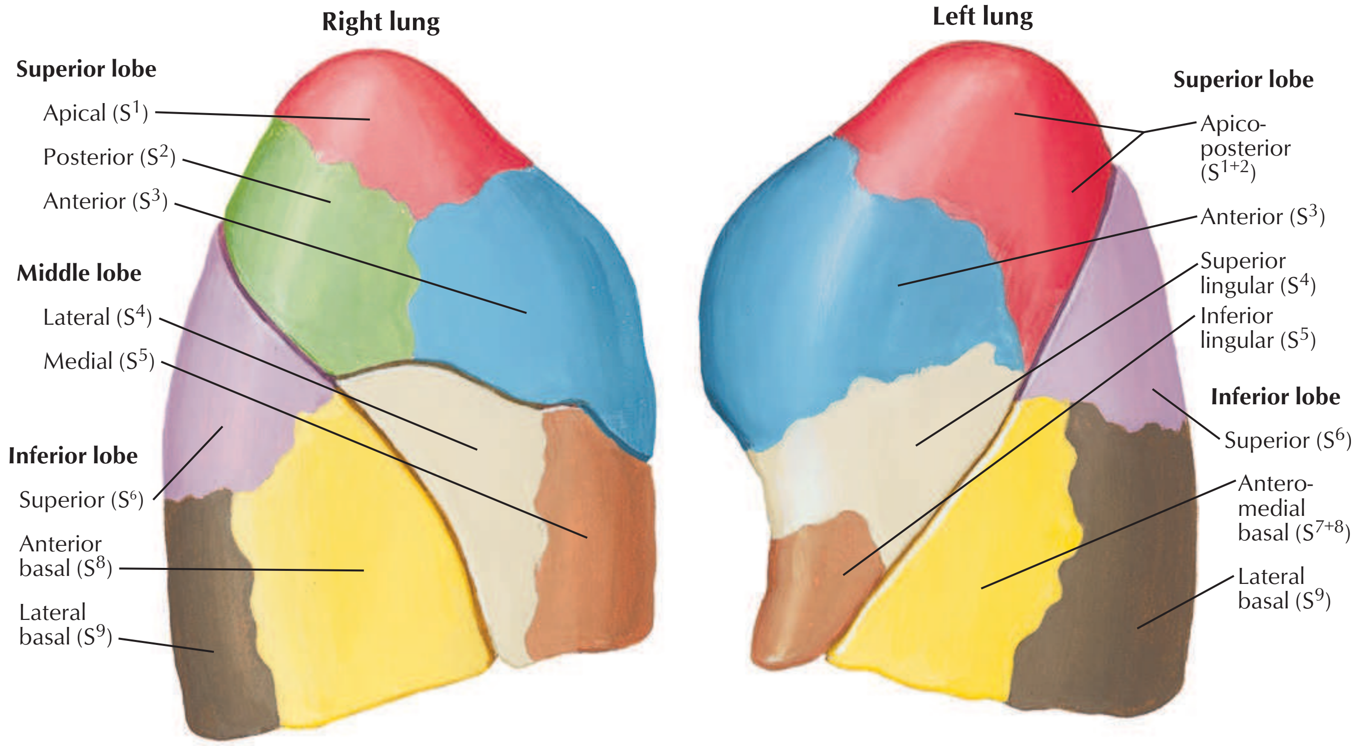
Anterior view


Right lung
Left lung
Superior lobe
Apical (S^1)
Anterior (S^3)
Posterior (S^2)
Middle lobe
Lateral (S^4)
Medial (S^5)
Inferior lobe
Anterior basal (S^8)
Medial basal (S^7)
Lateral basal (S^9)
Posterior basal (S^{10})
Superior lobe
Apico-posterior (S^{1+2})
Anterior (S^3)
Superior lingular (S^4)
Inferior lingular (S^5)
Inferior lobe
Anteromedial basal (S^{7+8})
Posterior basal (S^{10})
Lateral basal (S^9)
1
2
3
4
5
6
7

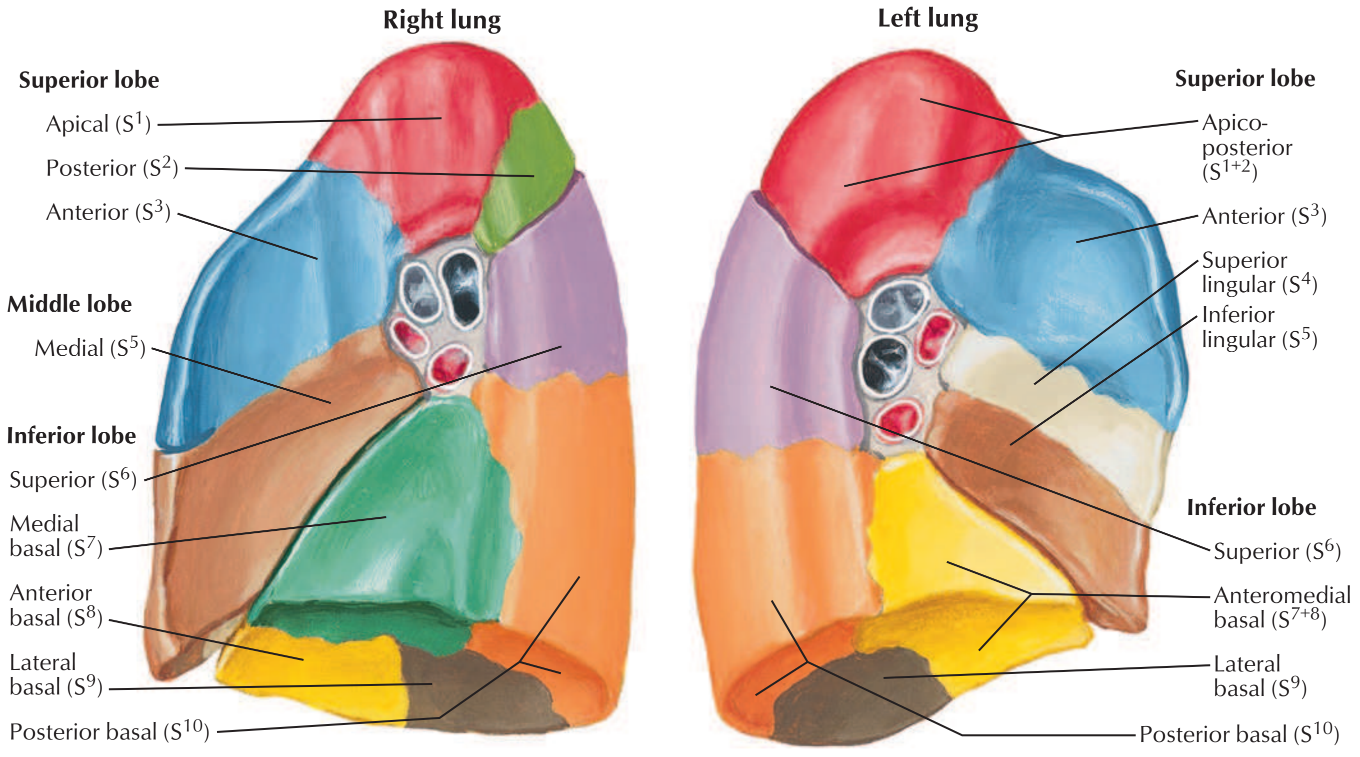
Posterior view


Left lung
Right lung
Superior lobe
Apico-posterior (S^{1+2})
Anterior (S^3)
Superior lingular (S^4)
Inferior lobe
Superior (S^6)
Lateral basal (S^9)
Posterior basal (S^{10})
Superior lobe
Apical (S^1)
Posterior (S^2)
Anterior (S^3)
Middle lobe
Lateral (S^4)
Inferior lobe
Superior (S^6)
Lateral basal (S^9)
Posterior basal (S^{10})
1
2
3
4
5
6
7
8
9
10
T
1
2
3
4
5
6
7
8
9
10

Lateral views

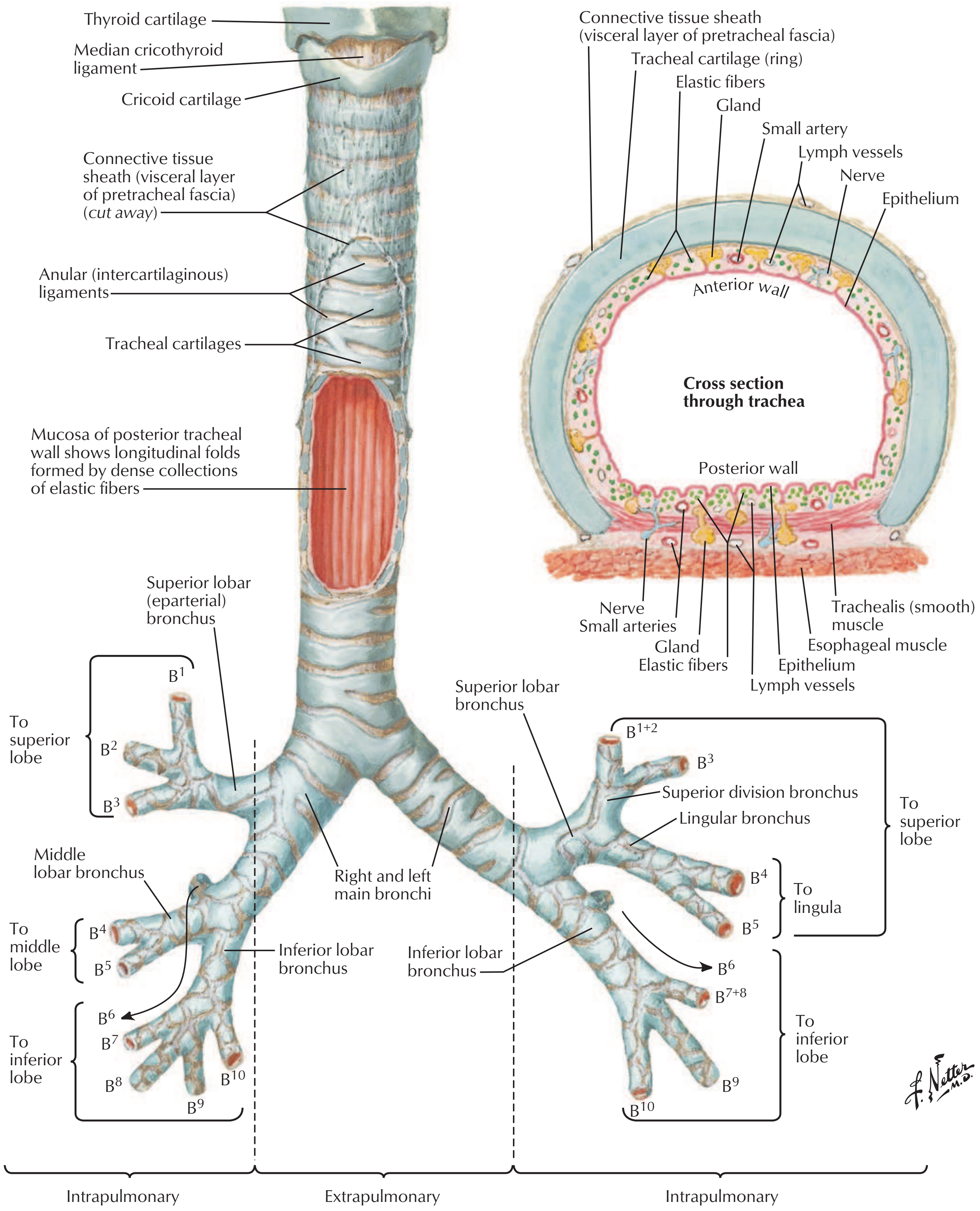

Right lung
Superior lobe
Apical (S1)
Posterior (S2)
Anterior (S3)
Middle lobe
Lateral (S4)
Medial (S5)
Inferior lobe
Superior (S6)
Anterior basal (S8)
Lateral basal (S9)
Left lung
Superior lobe
Apico-posterior (S1+2)
Anterior (S3)
Superior lingular (S4)
Inferior lingular (S5)
Inferior lobe
Superior (S6)
Antero-medial basal (S7+8)
Lateral basal (S9)

Medial views


Right lung
Superior lobe
Apical (S1)
Posterior (S2)
Anterior (S3)
Middle lobe
Medial (S5)
Inferior lobe
Superior (S6)
Medial basal (S7)
Anterior basal (S8)
Lateral basal (S9)
Posterior basal (S10)
Left lung
Superior lobe
Apico-posterior (S1+2)
Anterior (S3)
Superior lingular (S4)
Inferior lingular (S5)
Inferior lobe
Superior (S6)
Anteromedial basal (S7+8)
Lateral basal (S9)
Posterior basal (S10)

Trachea and Major Bronchi

See also Plates 81, 211, 214



Thyroid cartilage
Median cricothyroid ligament
Cricoid cartilage
Connective tissue sheath (visceral layer of pretracheal fascia) (*cut away*)
Anular (intercartilaginous) ligaments
Tracheal cartilages
Mucosa of posterior tracheal wall shows longitudinal folds formed by dense collections of elastic fibers
Connective tissue sheath (visceral layer of pretracheal fascia)
Tracheal cartilage (ring)
Elastic fibers
Gland
Small artery
Lymph vessels
Nerve
Epithelium
Anterior wall
Cross section through trachea
Posterior wall
Nerve
Small arteries
Gland
Elastic fibers
Lymph vessels
Epithelium
Trachealis (smooth) muscle
Esophageal muscle
Superior lobar (eparterial) bronchus
To superior lobe
B1
B2
B3
Middle lobar bronchus
To middle lobe
B4
B5
To inferior lobe
B6
B7
B8
B9
B10
Inferior lobar bronchus
Right and left main bronchi
Inferior lobar bronchus
Superior lobar bronchus
B1+2
B3
Superior division bronchus
Lingular bronchus
To superior lobe
B4
B5
To lingula
B6
B7+8
B9
B10
To inferior lobe
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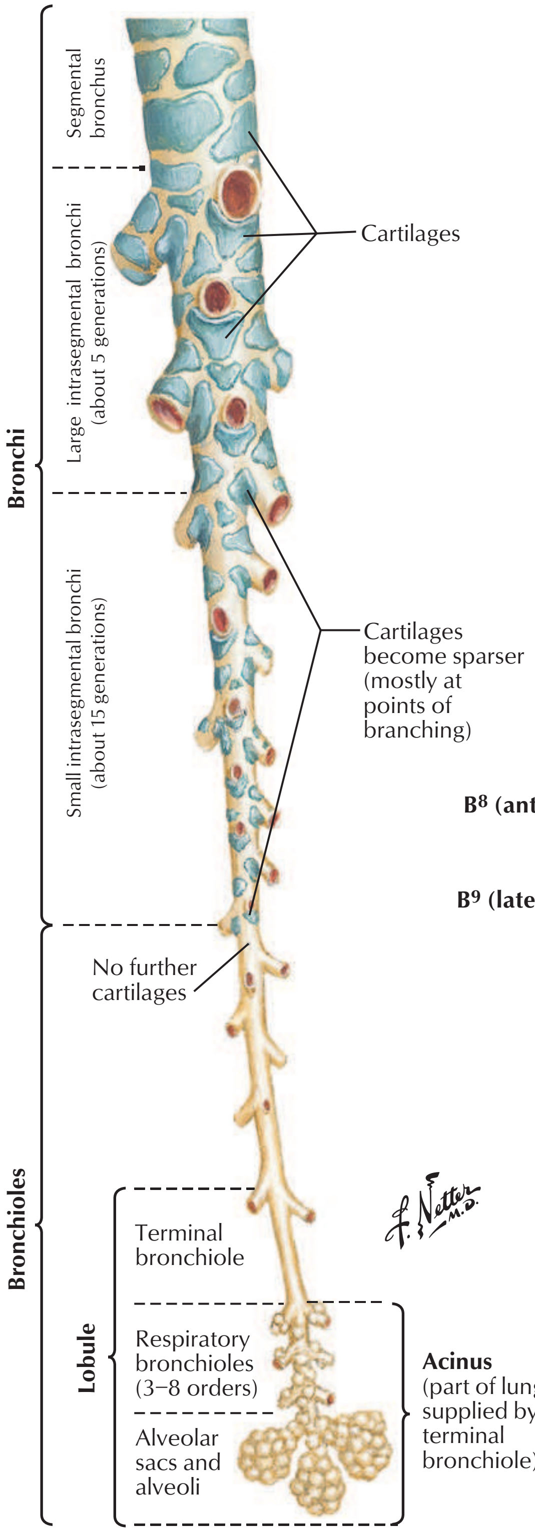
Intrapulmonary
Extrapulmonary
Intrapulmonary


Bronchi
Segmental bronchus
Large intrasegmental bronchi (about 5 generations)
Small intrasegmental bronchi (about 15 generations)
Cartilages
Cartilages become sparser (mostly at points of branching)
No further cartilages
Bronchioles
Lobule
Terminal bronchiole
Respiratory bronchioles (3–8 orders)
Alveolar sacs and alveoli
Acinus (part of lung supplied by terminal bronchiole)
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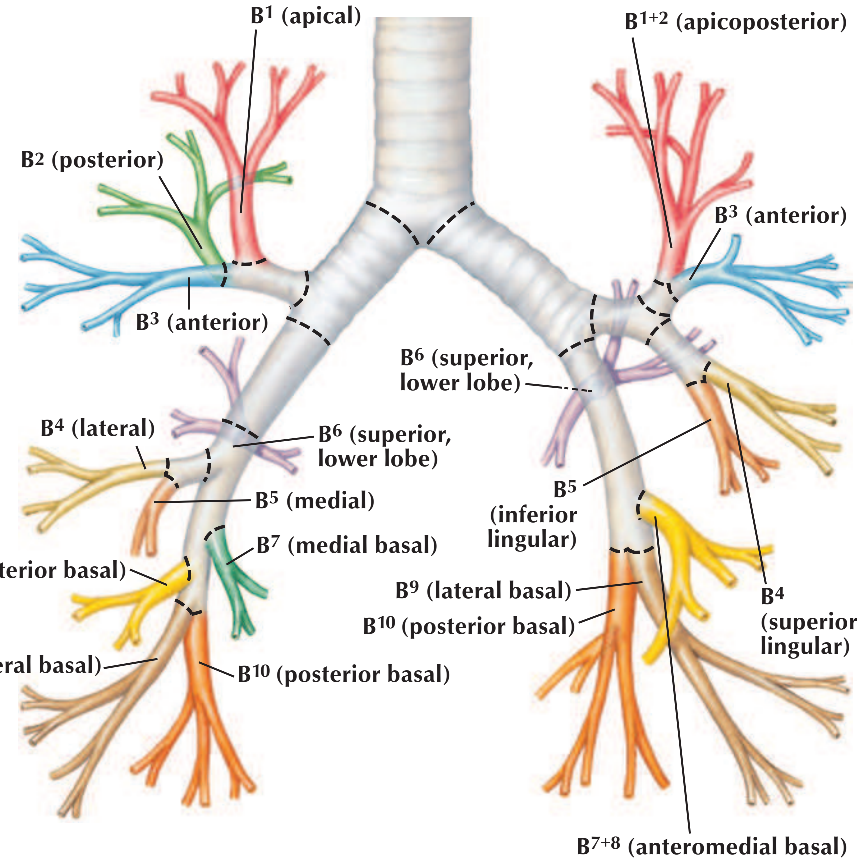
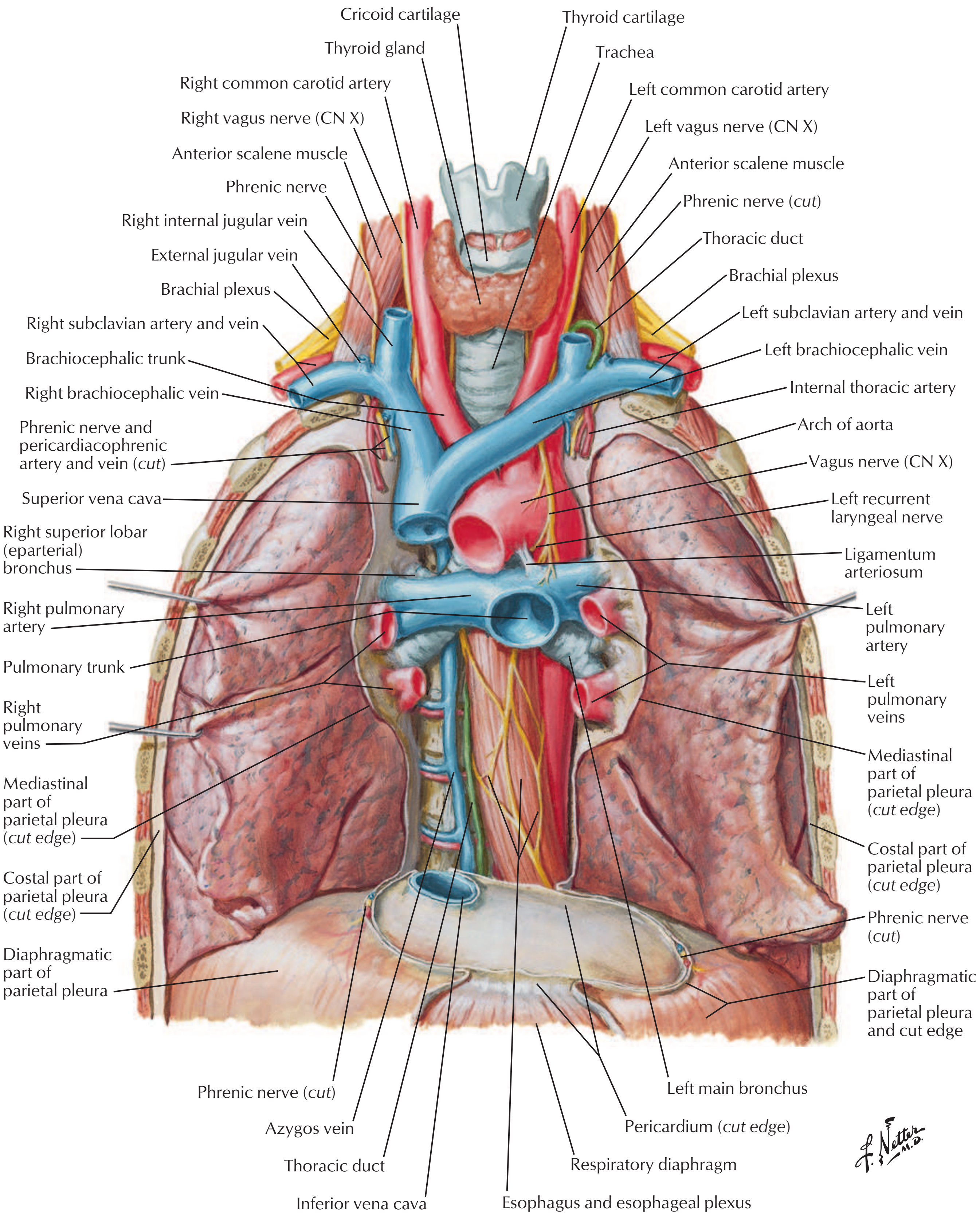
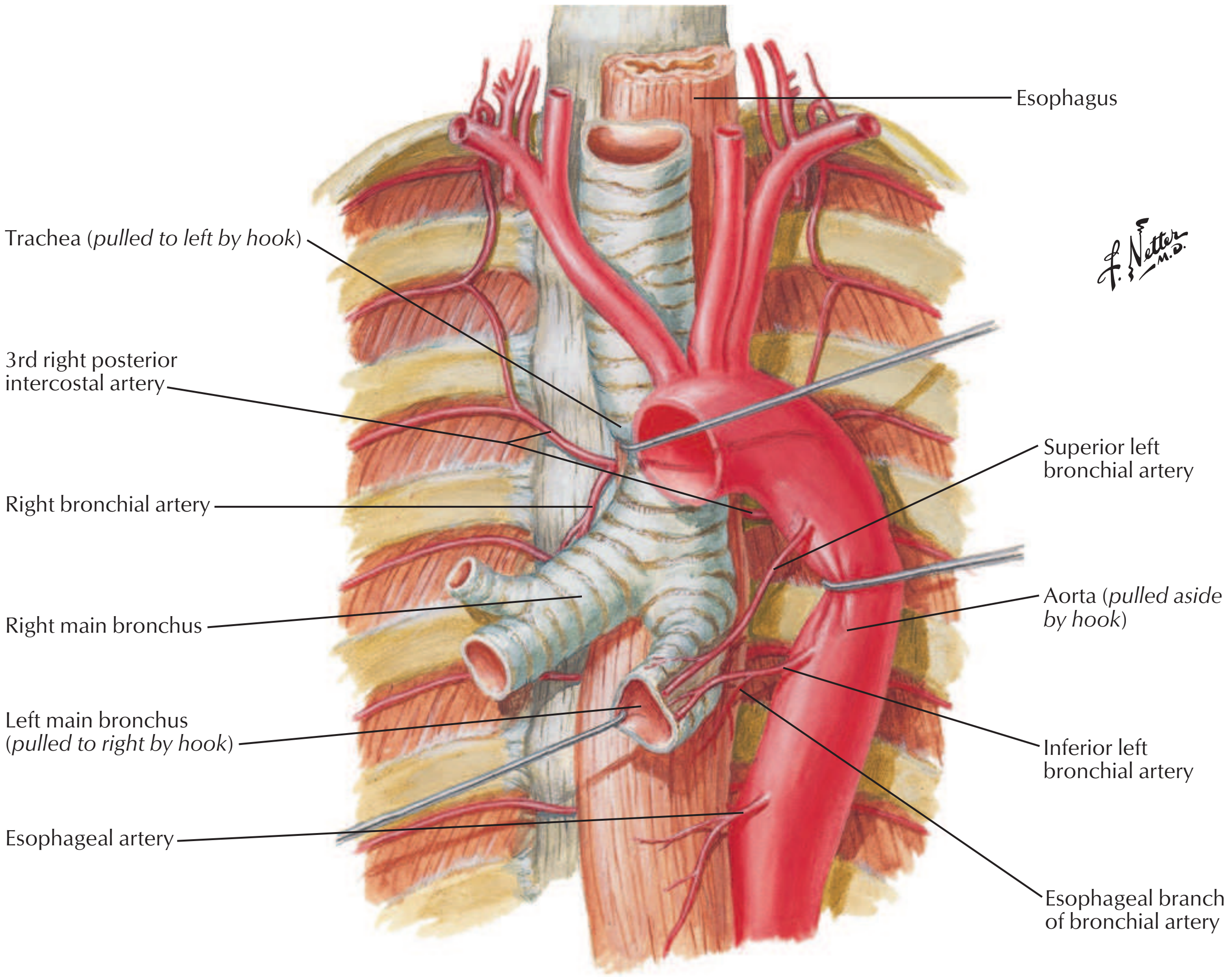
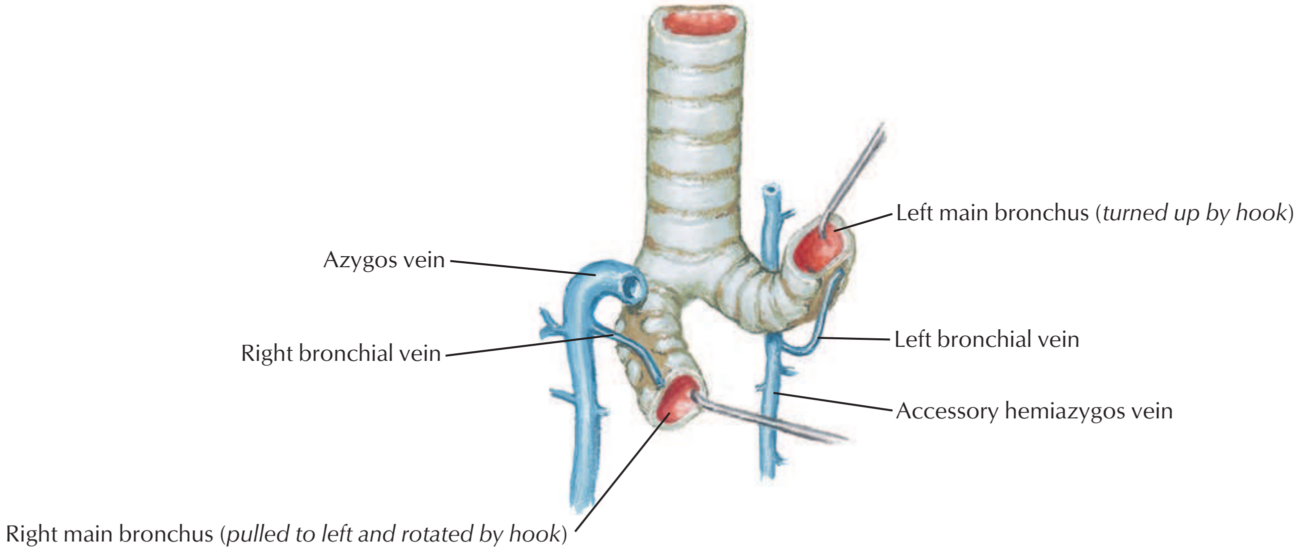
Subdivisions of intrapulmonary airways


B1 (apical)
B2 (posterior)
B3 (anterior)
B4 (lateral)
B5 (medial)
B6 (superior, lower lobe)
B7 (medial basal)
B8 (anterior basal)
B9 (lateral basal)
B10 (posterior basal)
B1+2 (apicoposterior)
B3 (anterior)
B6 (superior, lower lobe)
B5 (inferior lingular)
B4 (superior lingular)
B9 (lateral basal)
B10 (posterior basal)
B7+8 (anteromedial basal)

Nomenclature in common usage for bronchopulmonary segments (Plates 206 and 207) is that of Jackson and Huber, and segmental bronchi are named accordingly. Bronchial subdivisions as far as the 5th or 6th generations also are shown but not labelled. Segmental bronchi (B) are numbered from 1 to 10 in each lung, corresponding to the pulmonary segments. In the left lung, B^1 and B^2 are combined, as are B^7 and B^8. Variations of the standard bronchial pattern shown here are common, especially in peripheral airways.

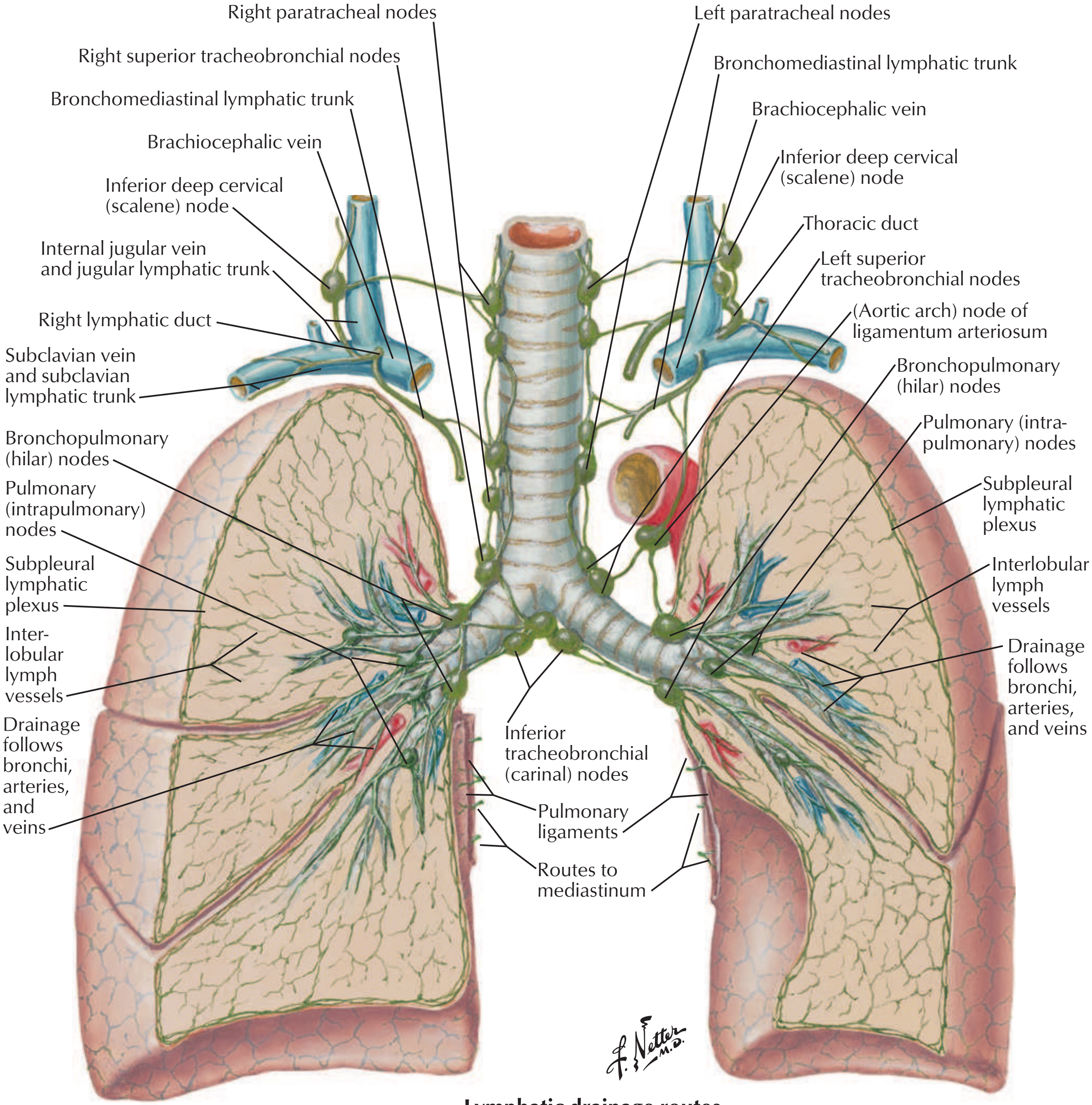

Cricoid cartilage
Thyroid cartilage
Thyroid gland
Trachea
Right common carotid artery
Left common carotid artery
Right vagus nerve (CN X)
Left vagus nerve (CN X)
Anterior scalene muscle
Anterior scalene muscle
Phrenic nerve
Phrenic nerve (*cut*)
Right internal jugular vein
Thoracic duct
External jugular vein
Brachial plexus
Brachial plexus
Left subclavian artery and vein
Right subclavian artery and vein
Left brachiocephalic vein
Brachiocephalic trunk
Internal thoracic artery
Right brachiocephalic vein
Arch of aorta
Phrenic nerve and pericardiacophrenic artery and vein (*cut*)
Vagus nerve (CN X)
Superior vena cava
Left recurrent laryngeal nerve
Right superior lobar (eparterial) bronchus
Ligamentum arteriosum
Right pulmonary artery
Left pulmonary artery
Pulmonary trunk
Left pulmonary veins
Right pulmonary veins
Mediastinal part of parietal pleura (*cut edge*)
Mediastinal part of parietal pleura (*cut edge*)
Costal part of parietal pleura (*cut edge*)
Costal part of parietal pleura (*cut edge*)
Phrenic nerve (*cut*)
Diaphragmatic part of parietal pleura
Diaphragmatic part of parietal pleura and cut edge
Phrenic nerve (*cut*)
Left main bronchus
Azygos vein
Pericardium (*cut edge*)
Thoracic duct
Respiratory diaphragm
Inferior vena cava
Esophagus and esophageal plexus


Esophagus
Trachea (*pulled to left by hook*)
3rd right posterior intercostal artery
Right bronchial artery
Right main bronchus
Left main bronchus (*pulled to right by hook*)
Esophageal artery
Superior left bronchial artery
Aorta (*pulled aside by hook*)
Inferior left bronchial artery
Esophageal branch of bronchial artery


Left main bronchus (*turned up by hook*)
Azygos vein
Right bronchial vein
Left bronchial vein
Accessory hemiazygos vein
Right main bronchus (*pulled to left and rotated by hook*)

Lymph Vessels and Nodes of Lung

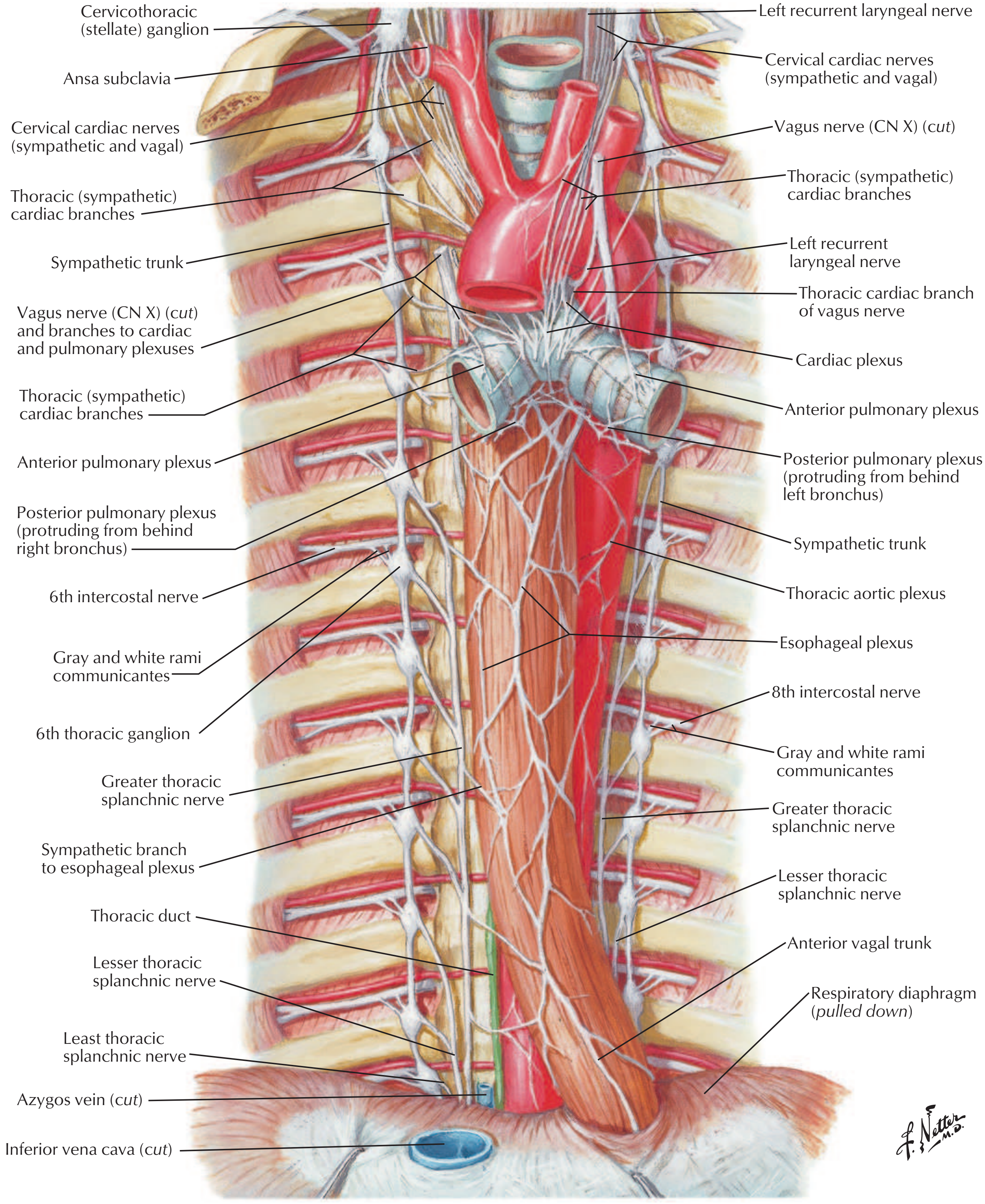
See also **Plates 85, 242**


Right paratracheal nodes
Right superior tracheobronchial nodes
Bronchomediastinal lymphatic trunk
Brachiocephalic vein
Inferior deep cervical (scalene) node
Internal jugular vein and jugular lymphatic trunk
Right lymphatic duct
Subclavian vein and subclavian lymphatic trunk
Bronchopulmonary (hilar) nodes
Pulmonary (intrapulmonary) nodes
Subpleural lymphatic plexus
Interlobular lymph vessels
Drainage follows bronchi, arteries, and veins
Left paratracheal nodes
Bronchomediastinal lymphatic trunk
Brachiocephalic vein
Inferior deep cervical (scalene) node
Thoracic duct
Left superior tracheobronchial nodes
(Aortic arch) node of ligamentum arteriosum
Bronchopulmonary (hilar) nodes
Pulmonary (intra-pulmonary) nodes
Subpleural lymphatic plexus
Interlobular lymph vessels
Drainage follows bronchi, arteries, and veins
Inferior tracheobronchial (carinal) nodes
Pulmonary ligaments
Routes to mediastinum

Lymphatic drainage routes

Right lung: All lobes drain to pulmonary and bronchopulmonary (hilar) nodes, then to inferior tracheobronchial (carinal) nodes, right superior tracheobronchial nodes, and right paratracheal nodes on the way to the brachiocephalic vein via the bronchomediastinal lymphatic trunk and/or inferior deep cervical (scalene) node.

Left lung: The superior lobe drains to pulmonary and bronchopulmonary (hilar) nodes, inferior tracheobronchial (carinal) nodes, left superior tracheobronchial nodes, left paratracheal nodes and/or (aortic arch) node of ligamentum arteriosum, then to the brachiocephalic vein via the left bronchomediastinal trunk and thoracic duct. The left inferior lobe also drains to the pulmonary and bronchopulmonary (hilar) nodes and to inferior tracheobronchial (carinal) nodes, but then mostly to right superior tracheobronchial nodes, where it follows the same route as lymph from the right lung.


Cervicothoracic (stellate) ganglion
Ansa subclavia
Cervical cardiac nerves (sympathetic and vagal)
Thoracic (sympathetic) cardiac branches
Sympathetic trunk
Vagus nerve (CN X) (*cut*) and branches to cardiac and pulmonary plexuses
Thoracic (sympathetic) cardiac branches
Anterior pulmonary plexus
Posterior pulmonary plexus (protruding from behind right bronchus)
6th intercostal nerve
Gray and white rami communicantes
6th thoracic ganglion
Greater thoracic splanchnic nerve
Sympathetic branch to esophageal plexus
Thoracic duct
Lesser thoracic splanchnic nerve
Least thoracic splanchnic nerve
Azygos vein (*cut*)
Inferior vena cava (*cut*)
Left recurrent laryngeal nerve
Cervical cardiac nerves (sympathetic and vagal)
Vagus nerve (CN X) (*cut*)
Thoracic (sympathetic) cardiac branches
Left recurrent laryngeal nerve
Thoracic cardiac branch of vagus nerve
Cardiac plexus
Anterior pulmonary plexus
Posterior pulmonary plexus (protruding from behind left bronchus)
Sympathetic trunk
Thoracic aortic plexus
Esophageal plexus
8th intercostal nerve
Gray and white rami communicantes
Greater thoracic splanchnic nerve
Lesser thoracic splanchnic nerve
Anterior vagal trunk
Respiratory diaphragm (*pulled down*)
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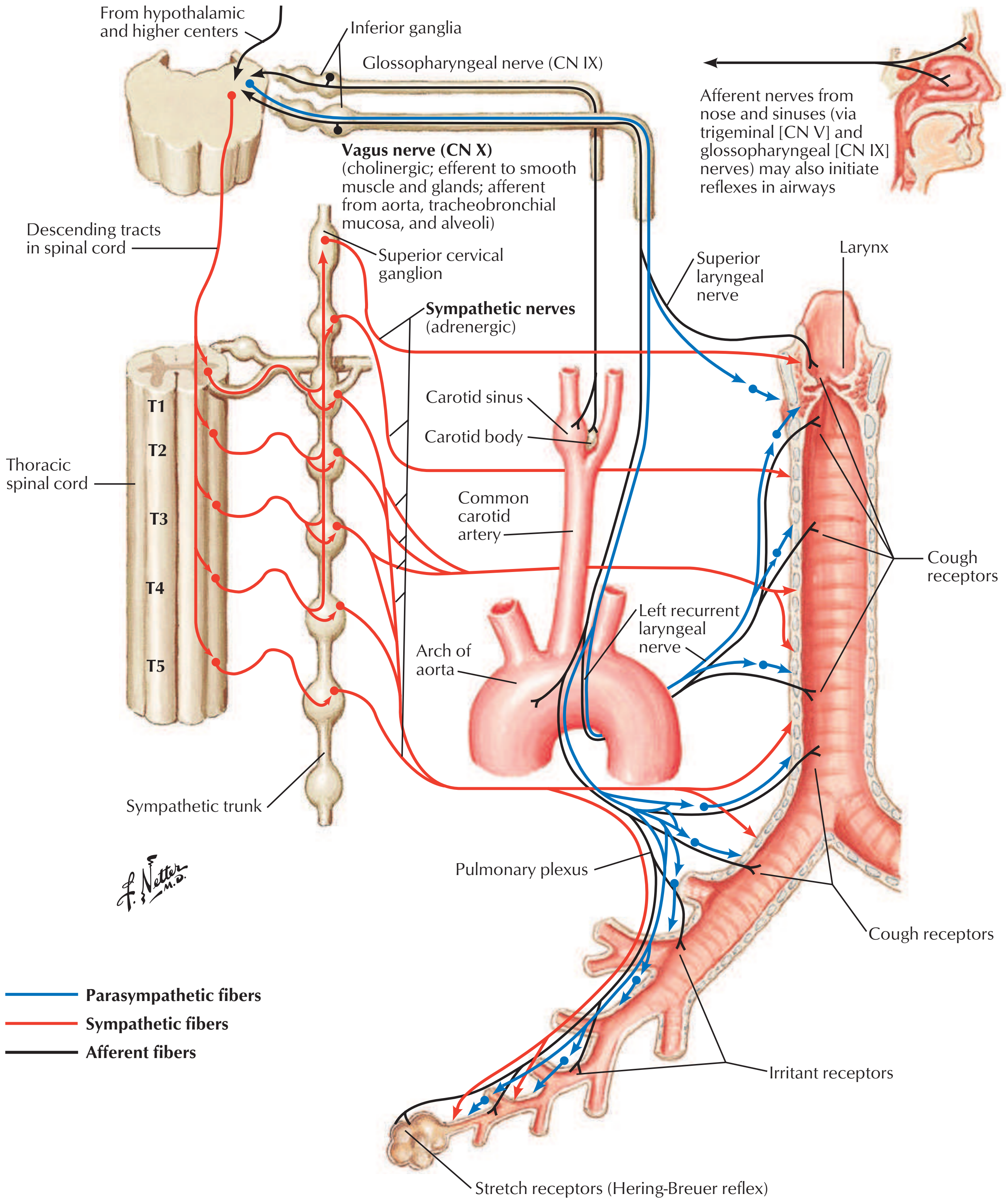
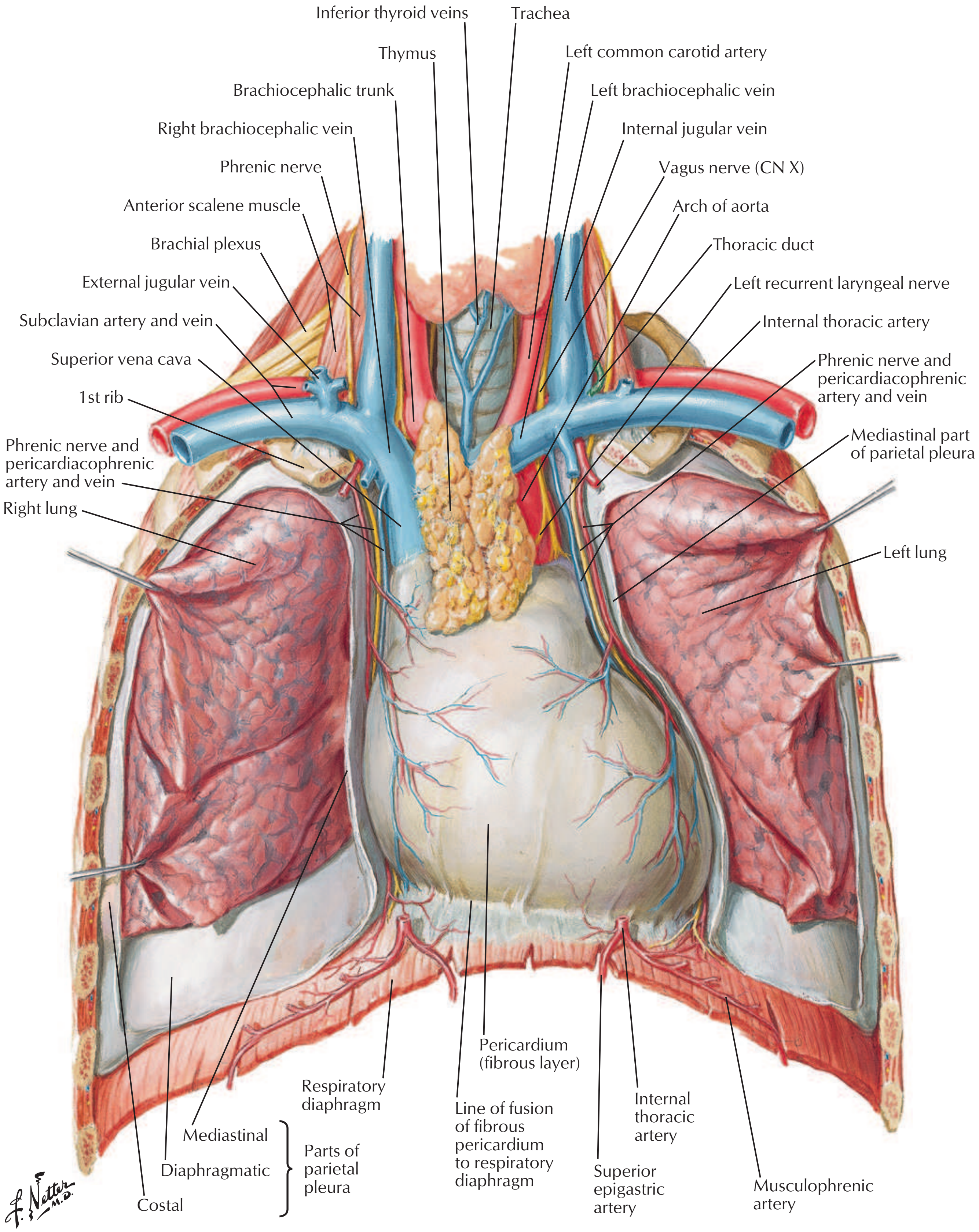
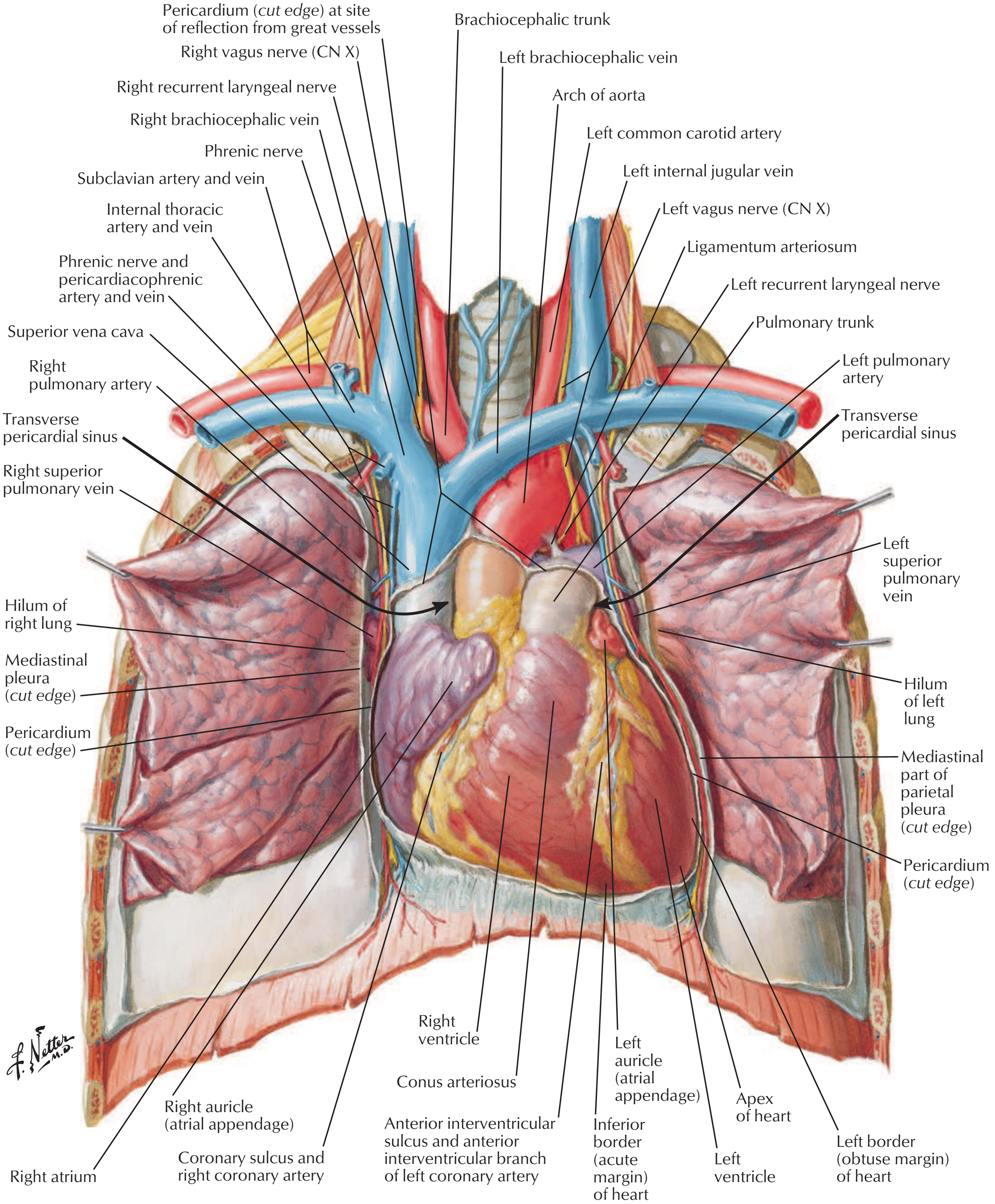
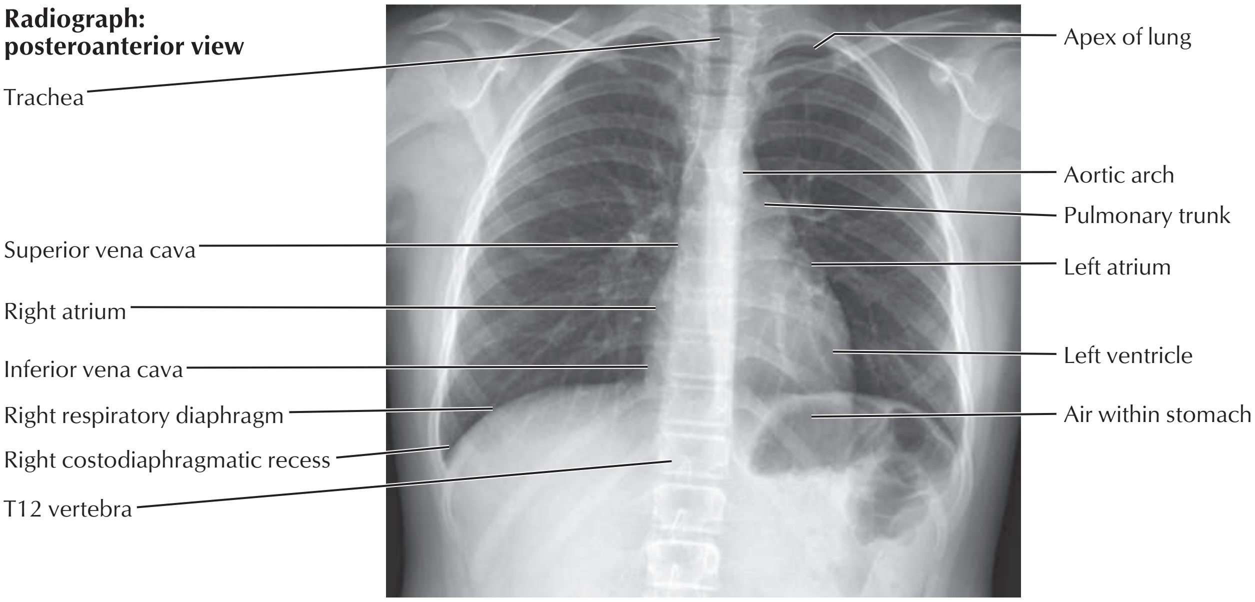
Innervation of Tracheobronchial Tree: Schema


From hypothalamic and higher centers
Inferior ganglia
Glossopharyngeal nerve (CN IX)
Afferent nerves from nose and sinuses (via trigeminal [CN V] and glossopharyngeal [CN IX] nerves) may also initiate reflexes in airways
Vagus nerve (CN X)
(cholinergic; efferent to smooth muscle and glands; afferent from aorta, tracheobronchial mucosa, and alveoli)
Descending tracts in spinal cord
Superior cervical ganglion
Sympathetic nerves
(adrenergic)
Superior laryngeal nerve
Larynx
Carotid sinus
Carotid body
T1
T2
Thoracic spinal cord
T3
Common carotid artery
Cough receptors
T4
Left recurrent laryngeal nerve
Arch of aorta
T5
Sympathetic trunk
Pulmonary plexus
Cough receptors
Parasympathetic fibers
Sympathetic fibers
Afferent fibers
Irritant receptors
Stretch receptors (Hering-Breuer reflex)


Inferior thyroid veins
Trachea
Thymus
Left common carotid artery
Brachiocephalic trunk
Left brachiocephalic vein
Right brachiocephalic vein
Internal jugular vein
Phrenic nerve
Vagus nerve (CN X)
Anterior scalene muscle
Arch of aorta
Brachial plexus
Thoracic duct
External jugular vein
Left recurrent laryngeal nerve
Subclavian artery and vein
Internal thoracic artery
Superior vena cava
Phrenic nerve and pericardiacophrenic artery and vein
1st rib
Mediastinal part of parietal pleura
Phrenic nerve and pericardiacophrenic artery and vein
Right lung
Left lung
Pericardium (fibrous layer)
Respiratory diaphragm
Internal thoracic artery
Line of fusion of fibrous pericardium to respiratory diaphragm
Mediastinal
Diaphragmatic
Costal
Parts of parietal pleura
Superior epigastric artery
Musculophrenic artery
F. Netter M.D.

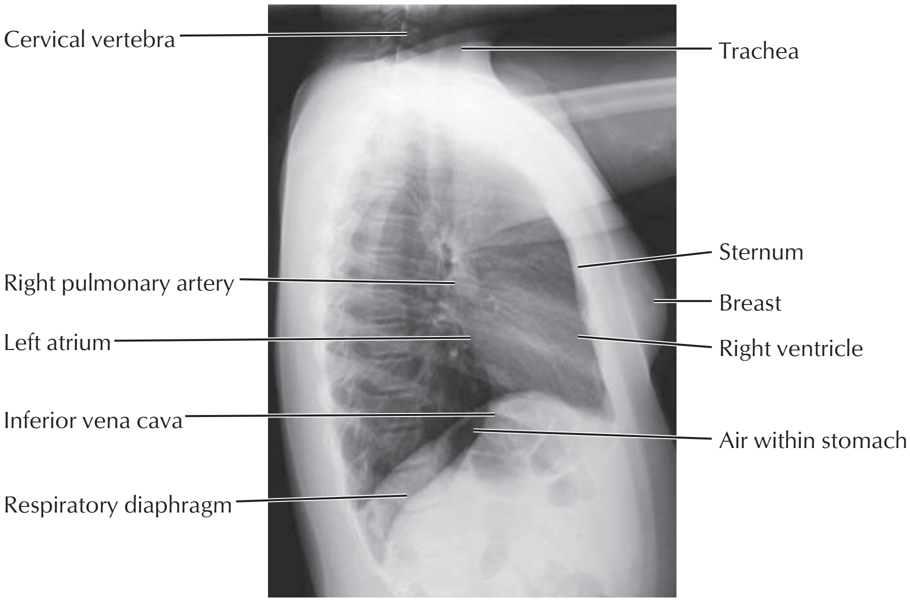

Pericardium (*cut edge*) at site of reflection from great vessels
Right vagus nerve (CN X)
Right recurrent laryngeal nerve
Right brachiocephalic vein
Phrenic nerve
Subclavian artery and vein
Internal thoracic artery and vein
Phrenic nerve and pericardiacophrenic artery and vein
Superior vena cava
Right pulmonary artery
Transverse pericardial sinus
Right superior pulmonary vein
Hilum of right lung
Mediastinal pleura (*cut edge*)
Pericardium (*cut edge*)
Brachiocephalic trunk
Left brachiocephalic vein
Arch of aorta
Left common carotid artery
Left internal jugular vein
Left vagus nerve (CN X)
Ligamentum arteriosum
Left recurrent laryngeal nerve
Pulmonary trunk
Left pulmonary artery
Transverse pericardial sinus
Left superior pulmonary vein
Hilum of left lung
Mediastinal part of parietal pleura (*cut edge*)
Pericardium (*cut edge*)
Right ventricle
Conus arteriosus
Left auricle (atrial appendage)
Apex of heart
Right auricle (atrial appendage)
Anterior interventricular sulcus and anterior interventricular branch of left coronary artery
Inferior border (acute margin) of heart
Left ventricle
Left border (obtuse margin) of heart
Right atrium
Coronary sulcus and right coronary artery
F. Netter M.D.

Radiograph: posteroanterior view



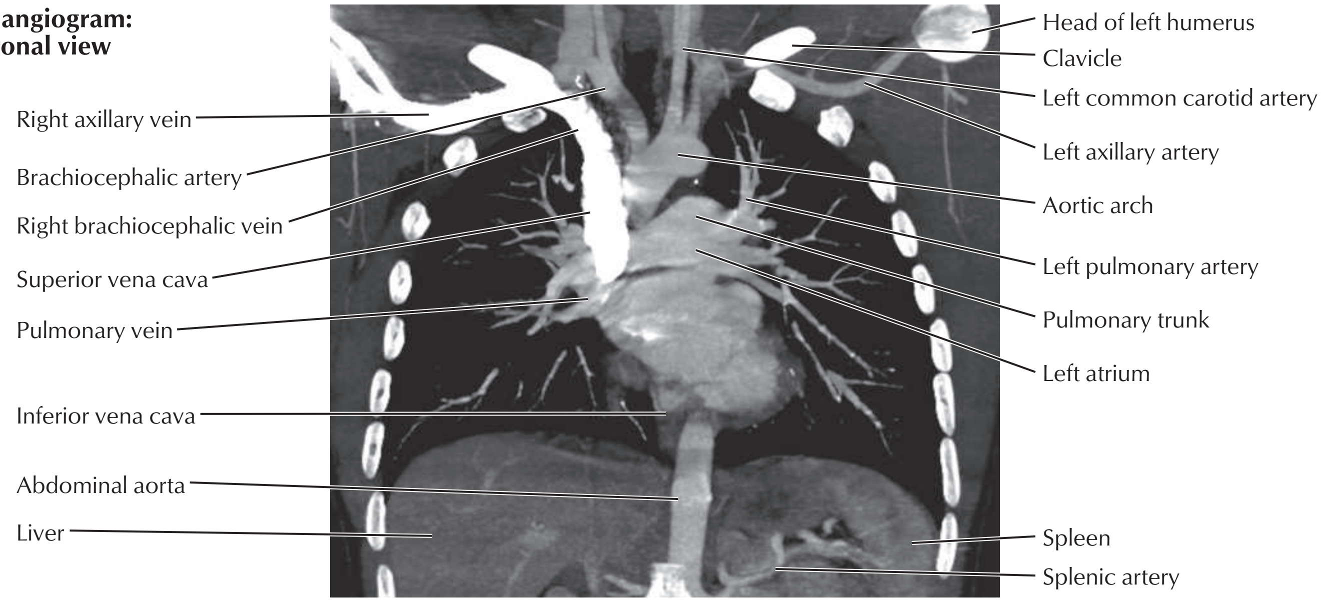
Trachea
Superior vena cava
Right atrium
Inferior vena cava
Right respiratory diaphragm
Right costodiaphragmatic recess
T12 vertebra
Apex of lung
Aortic arch
Pulmonary trunk
Left atrium
Left ventricle
Air within stomach

Radiograph: lateral view

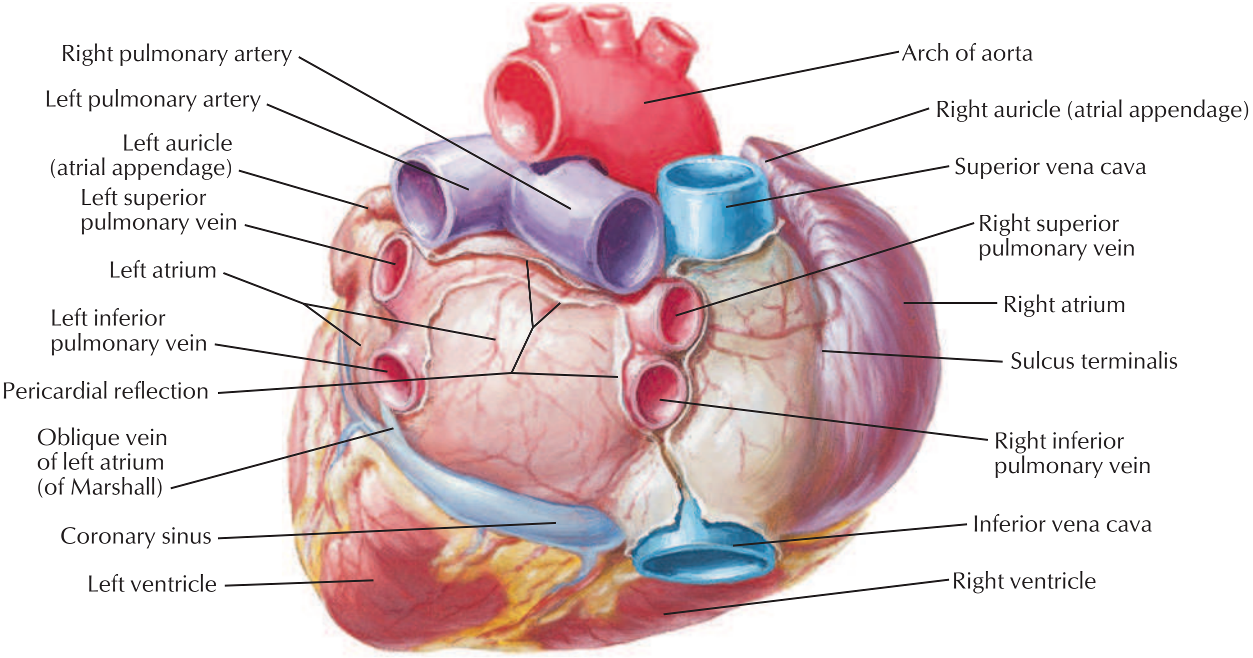


Cervical vertebra
Right pulmonary artery
Left atrium
Inferior vena cava
Respiratory diaphragm
Trachea
Sternum
Breast
Right ventricle
Air within stomach

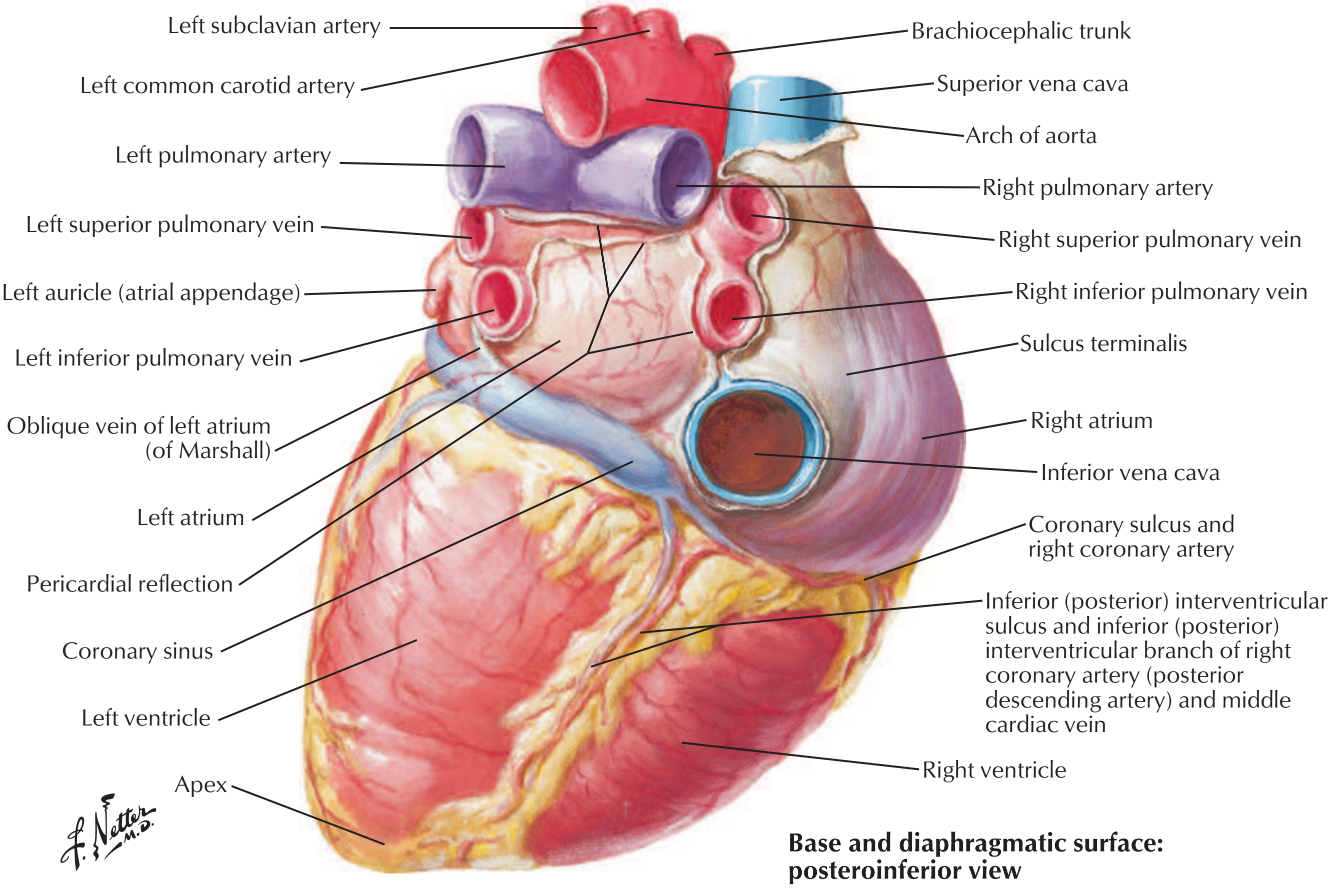
CT angiogram: coronal view



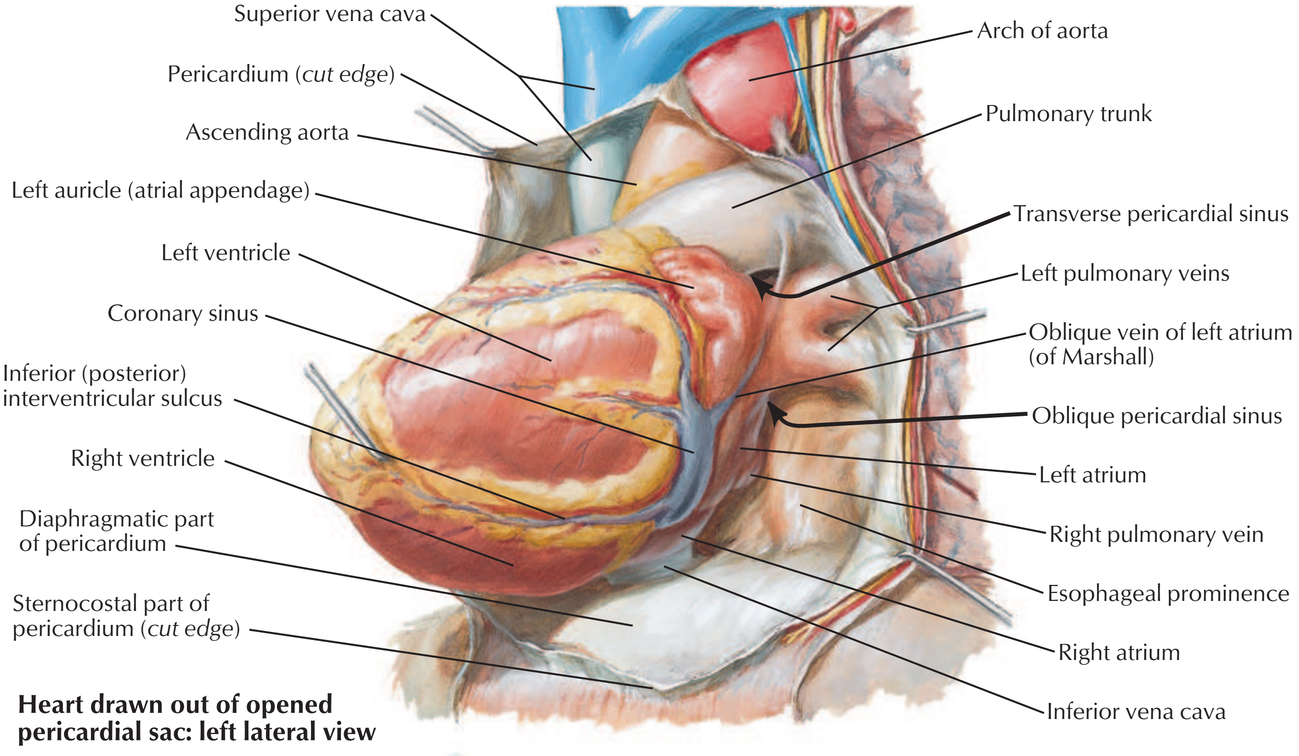
Right axillary vein
Brachiocephalic artery
Right brachiocephalic vein
Superior vena cava
Pulmonary vein
Inferior vena cava
Abdominal aorta
Liver
Head of left humerus
Clavicle
Left common carotid artery
Left axillary artery
Aortic arch
Left pulmonary artery
Pulmonary trunk
Left atrium
Spleen
Splenic artery


Right pulmonary artery
Left pulmonary artery
Left auricle (atrial appendage)
Left superior pulmonary vein
Left atrium
Left inferior pulmonary vein
Pericardial reflection
Oblique vein of left atrium (of Marshall)
Coronary sinus
Left ventricle
Arch of aorta
Right auricle (atrial appendage)
Superior vena cava
Right superior pulmonary vein
Right atrium
Sulcus terminalis
Right inferior pulmonary vein
Inferior vena cava
Right ventricle

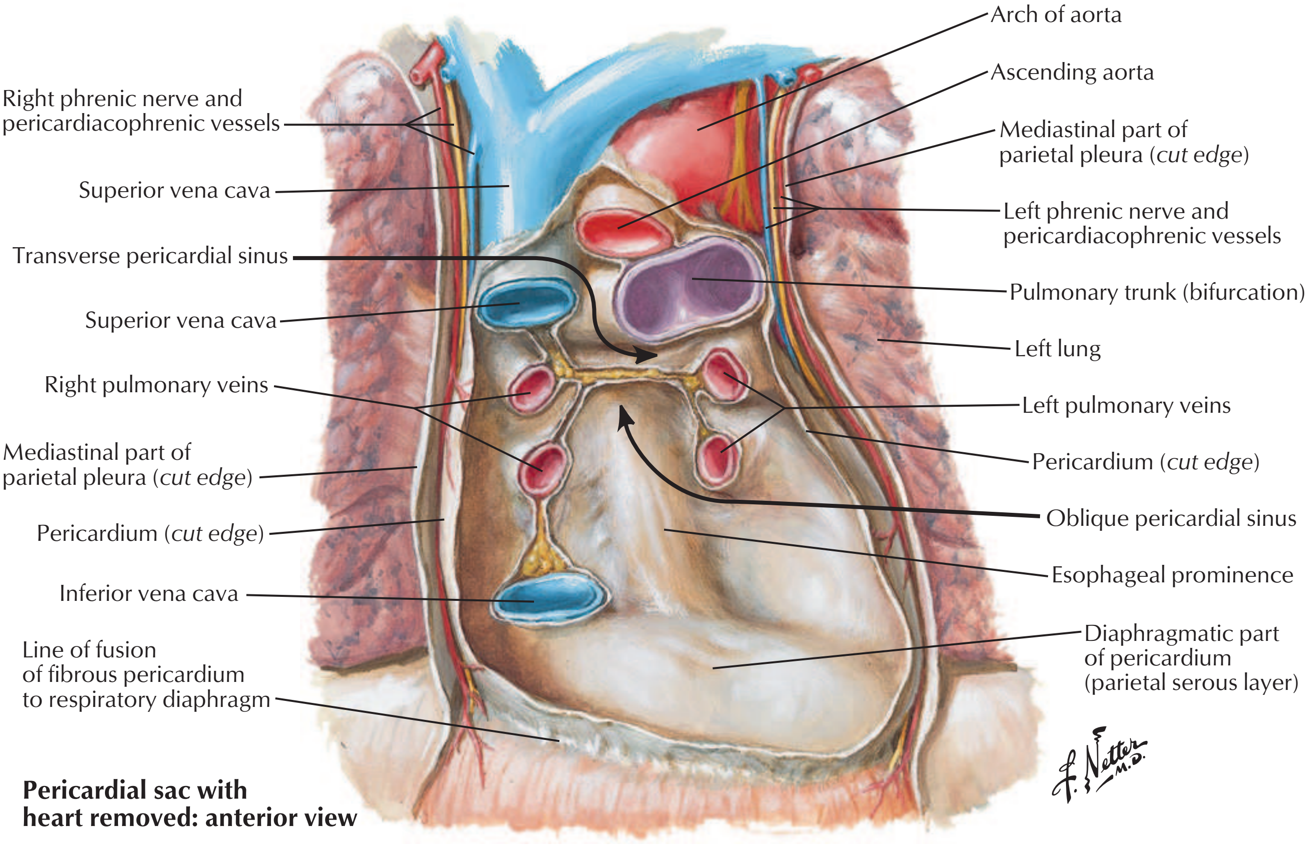
Base of heart: posterior view


Left subclavian artery
Left common carotid artery
Left pulmonary artery
Left superior pulmonary vein
Left auricle (atrial appendage)
Left inferior pulmonary vein
Oblique vein of left atrium (of Marshall)
Left atrium
Pericardial reflection
Coronary sinus
Left ventricle
Apex
Brachiocephalic trunk
Superior vena cava
Arch of aorta
Right pulmonary artery
Right superior pulmonary vein
Right inferior pulmonary vein
Sulcus terminalis
Right atrium
Inferior vena cava
Coronary sulcus and right coronary artery
Inferior (posterior) interventricular sulcus and inferior (posterior) interventricular branch of right coronary artery (posterior descending artery) and middle cardiac vein
Right ventricle

Base and diaphragmatic surface: posteroinferior view


Superior vena cava
Pericardium (*cut edge*)
Ascending aorta
Left auricle (atrial appendage)
Left ventricle
Coronary sinus
Inferior (posterior) interventricular sulcus
Right ventricle
Diaphragmatic part of pericardium
Sternocostal part of pericardium (*cut edge*)
Arch of aorta
Pulmonary trunk
Transverse pericardial sinus
Left pulmonary veins
Oblique vein of left atrium (of Marshall)
Oblique pericardial sinus
Left atrium
Right pulmonary vein
Esophageal prominence
Right atrium
Inferior vena cava

Heart drawn out of opened pericardial sac: left lateral view


Right phrenic nerve and pericardiacophrenic vessels
Superior vena cava
Transverse pericardial sinus
Superior vena cava
Right pulmonary veins
Mediastinal part of parietal pleura (*cut edge*)
Pericardium (*cut edge*)
Inferior vena cava
Line of fusion of fibrous pericardium to respiratory diaphragm
Arch of aorta
Ascending aorta
Mediastinal part of parietal pleura (*cut edge*)
Left phrenic nerve and pericardiacophrenic vessels
Pulmonary trunk (bifurcation)
Left lung
Left pulmonary veins
Pericardium (*cut edge*)
Oblique pericardial sinus
Esophageal prominence
Diaphragmatic part of pericardium (parietal serous layer)
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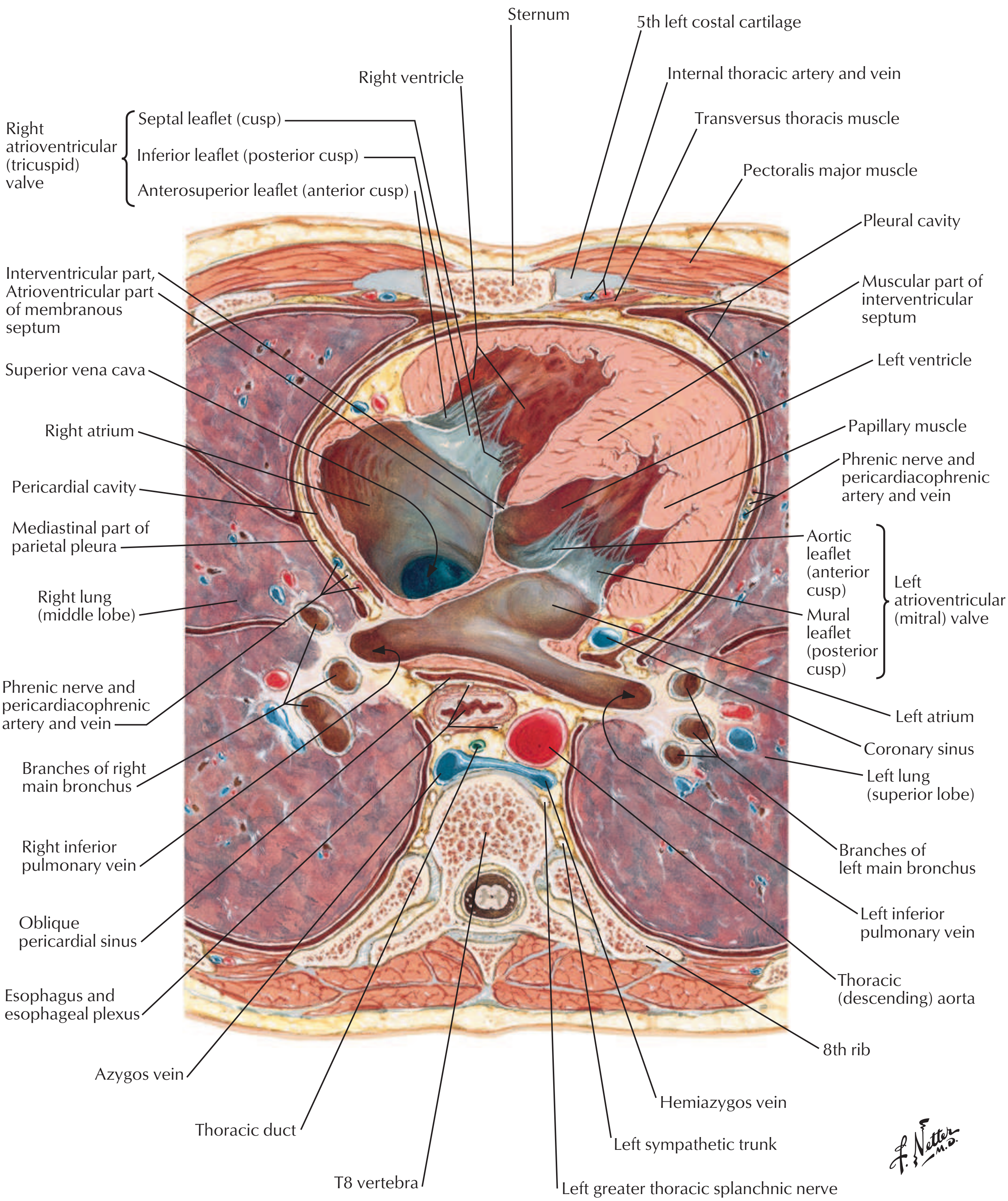
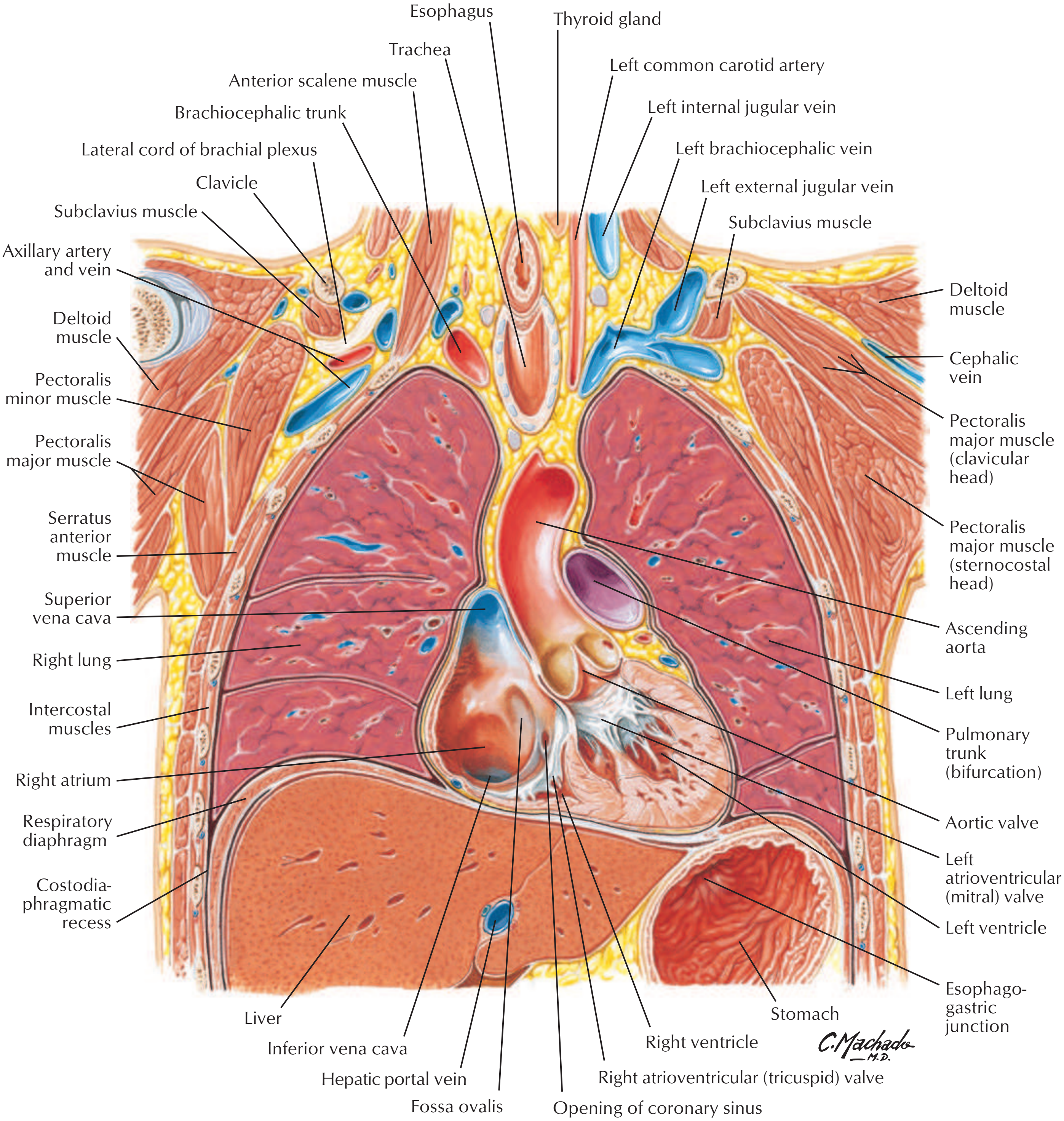
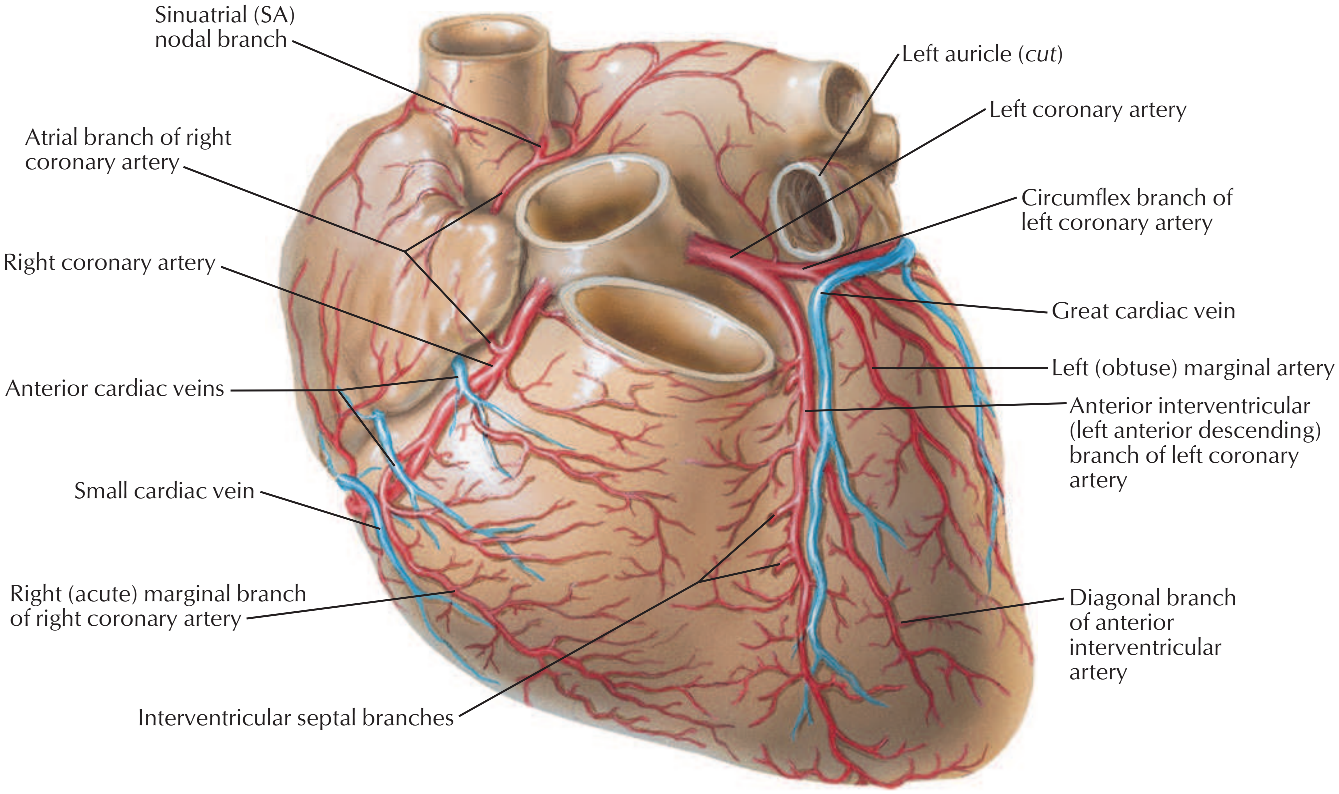
Pericardial sac with heart removed: anterior view

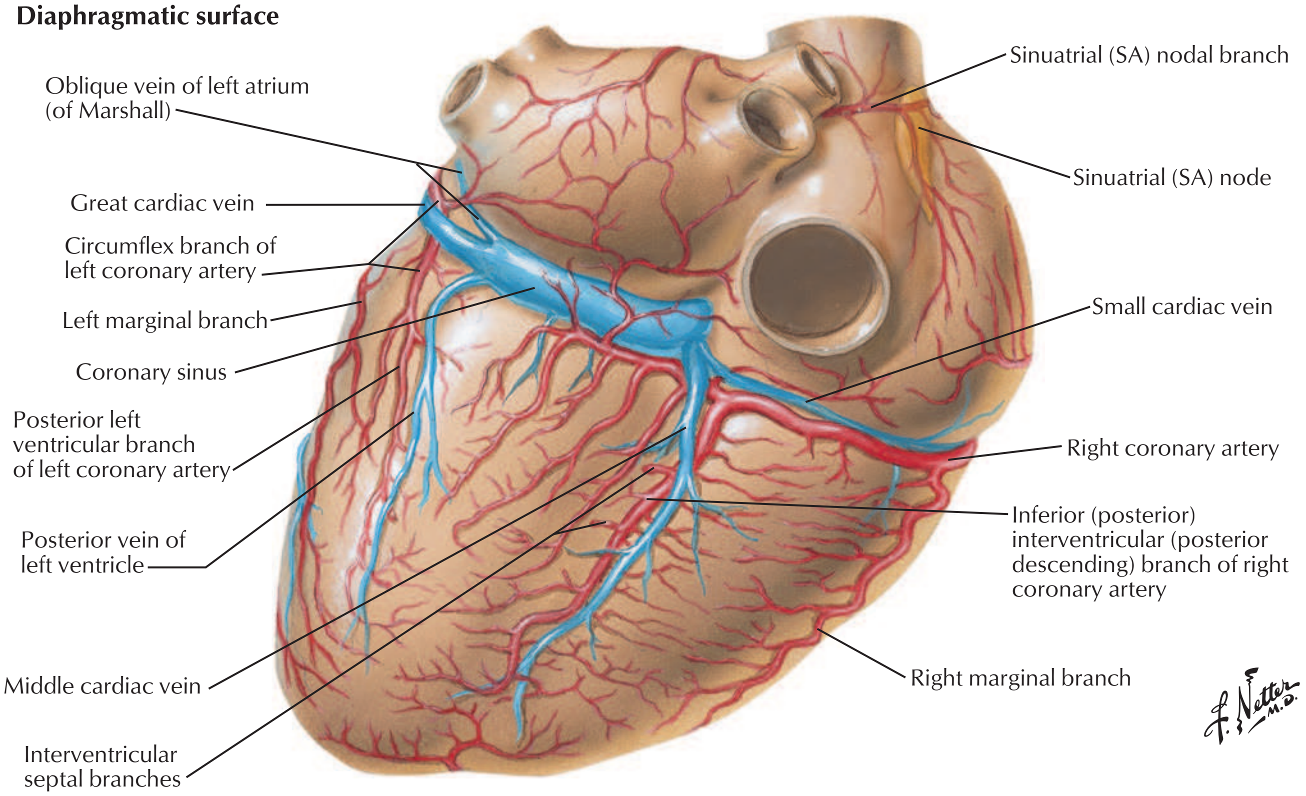

Sternum
5th left costal cartilage
Internal thoracic artery and vein
Transversus thoracis muscle
Pectoralis major muscle
Pleural cavity
Muscular part of interventricular septum
Left ventricle
Papillary muscle
Phrenic nerve and pericardiacophrenic artery and vein
Left atrioventricular (mitral) valve
Aortic leaflet (anterior cusp)
Mural leaflet (posterior cusp)
Left atrium
Coronary sinus
Left lung (superior lobe)
Branches of left main bronchus
Left inferior pulmonary vein
Thoracic (descending) aorta
8th rib
Hemiazygos vein
Left sympathetic trunk
Left greater thoracic splanchnic nerve
T8 vertebra
Thoracic duct
Azygos vein
Esophagus and esophageal plexus
Oblique pericardial sinus
Right inferior pulmonary vein
Branches of right main bronchus
Phrenic nerve and pericardiacophrenic artery and vein
Right lung (middle lobe)
Mediastinal part of parietal pleura
Pericardial cavity
Right atrium
Superior vena cava
Interventricular part, Atrioventricular part of membranous septum
Right atrioventricular (tricuspid) valve
Septal leaflet (cusp)
Inferior leaflet (posterior cusp)
Anterosuperior leaflet (anterior cusp)
Right ventricle

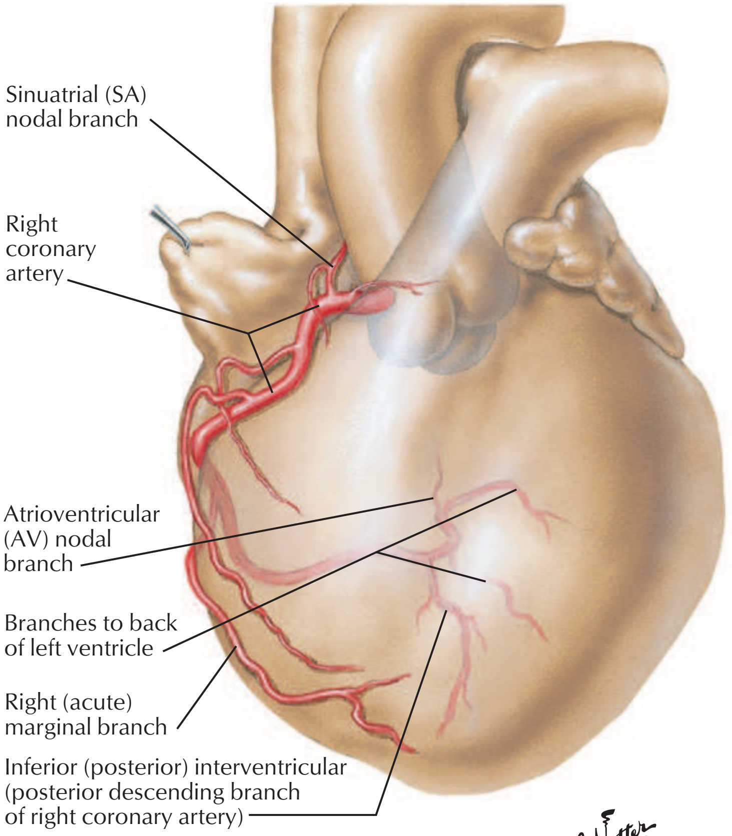

Esophagus
Thyroid gland
Trachea
Left common carotid artery
Anterior scalene muscle
Brachiocephalic trunk
Left internal jugular vein
Lateral cord of brachial plexus
Left brachiocephalic vein
Clavicle
Left external jugular vein
Subclavius muscle
Subclavius muscle
Axillary artery and vein
Deltoid muscle
Deltoid muscle
Cephalic vein
Pectoralis minor muscle
Pectoralis major muscle (clavicular head)
Pectoralis major muscle
Serratus anterior muscle
Pectoralis major muscle (sternocostal head)
Superior vena cava
Ascending aorta
Right lung
Left lung
Intercostal muscles
Pulmonary trunk (bifurcation)
Right atrium
Aortic valve
Respiratory diaphragm
Left atrioventricular (mitral) valve
Costodiaphragmatic recess
Left ventricle
Esophagogastric junction
Liver
Stomach
Inferior vena cava
Right ventricle
C.Machado M.D.
Hepatic portal vein
Right atrioventricular (tricuspid) valve
Fossa ovalis
Opening of coronary sinus

Sternocostal surface


Sinuatrial (SA) nodal branch
Atrial branch of right coronary artery
Right coronary artery
Anterior cardiac veins
Small cardiac vein
Right (acute) marginal branch of right coronary artery
Interventricular septal branches
Left auricle (*cut*)
Left coronary artery
Circumflex branch of left coronary artery
Great cardiac vein
Left (obtuse) marginal artery
Anterior interventricular (left anterior descending) branch of left coronary artery
Diagonal branch of anterior interventricular artery

Diaphragmatic surface


Oblique vein of left atrium (of Marshall)
Great cardiac vein
Circumflex branch of left coronary artery
Left marginal branch
Coronary sinus
Posterior left ventricular branch of left coronary artery
Posterior vein of left ventricle
Middle cardiac vein
Interventricular septal branches
Sinuatrial (SA) nodal branch
Sinuatrial (SA) node
Small cardiac vein
Right coronary artery
Inferior (posterior) interventricular (posterior descending) branch of right coronary artery
Right marginal branch


Sinuatrial (SA) nodal branch
Right coronary artery
Atrioventricular (AV) nodal branch
Branches to back of left ventricle
Right (acute) marginal branch
Inferior (posterior) interventricular (posterior descending branch of right coronary artery)

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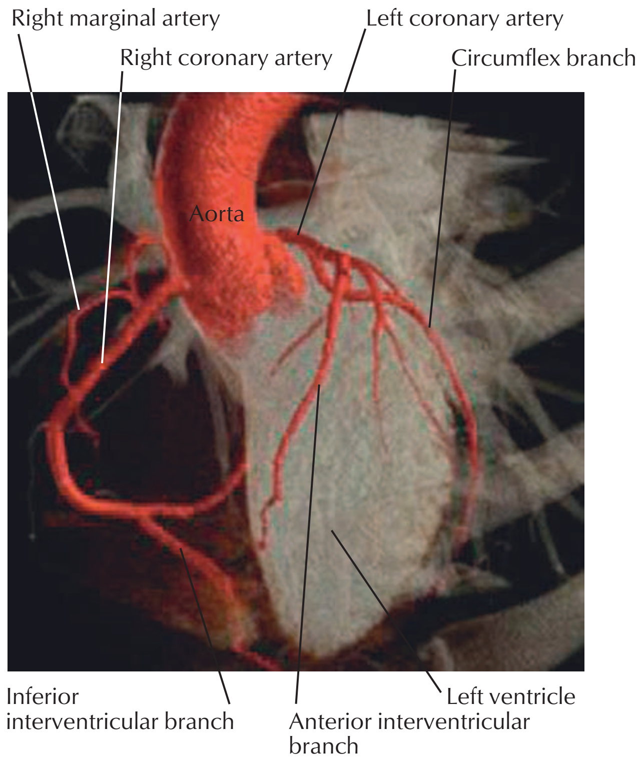
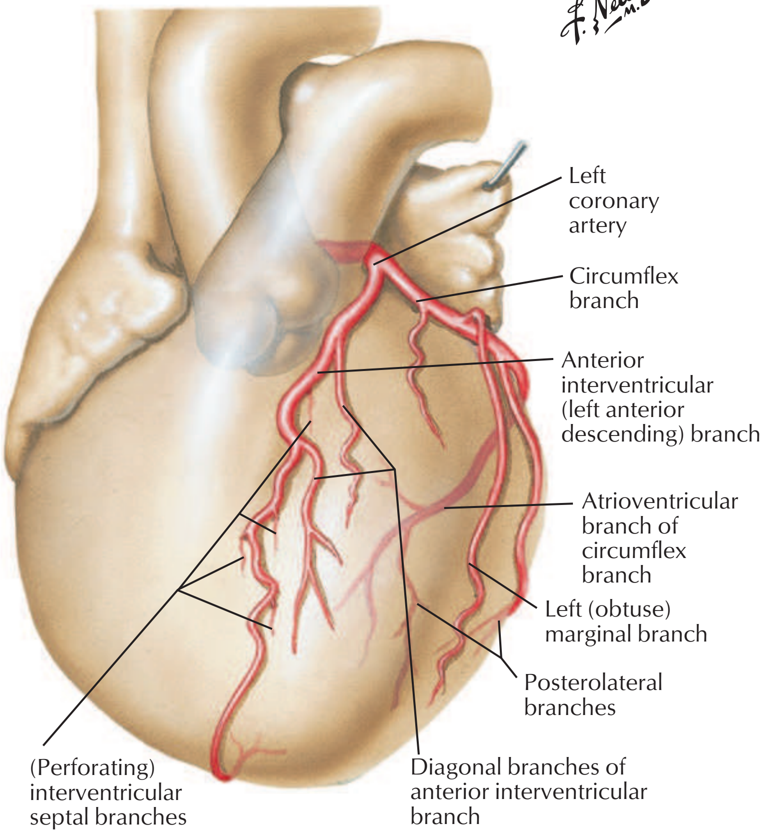
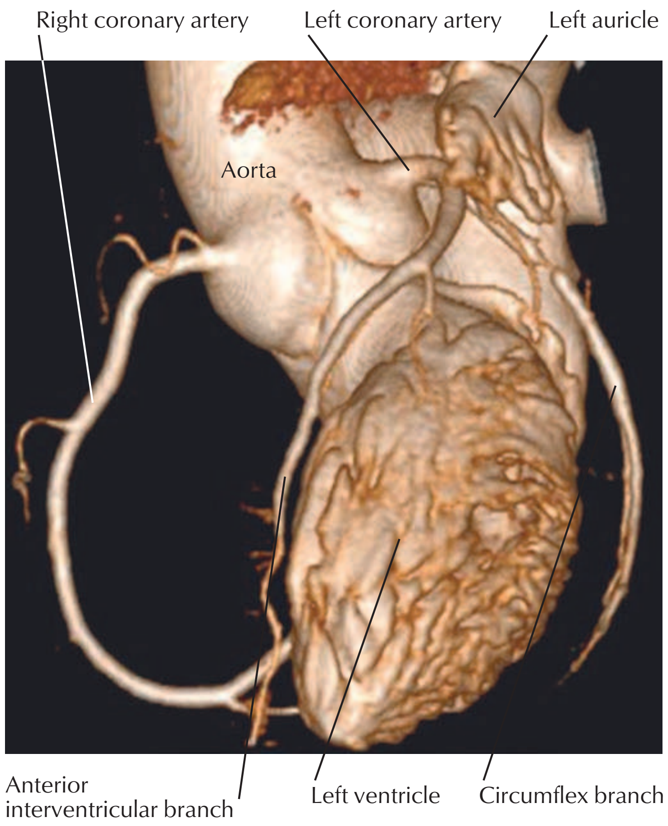
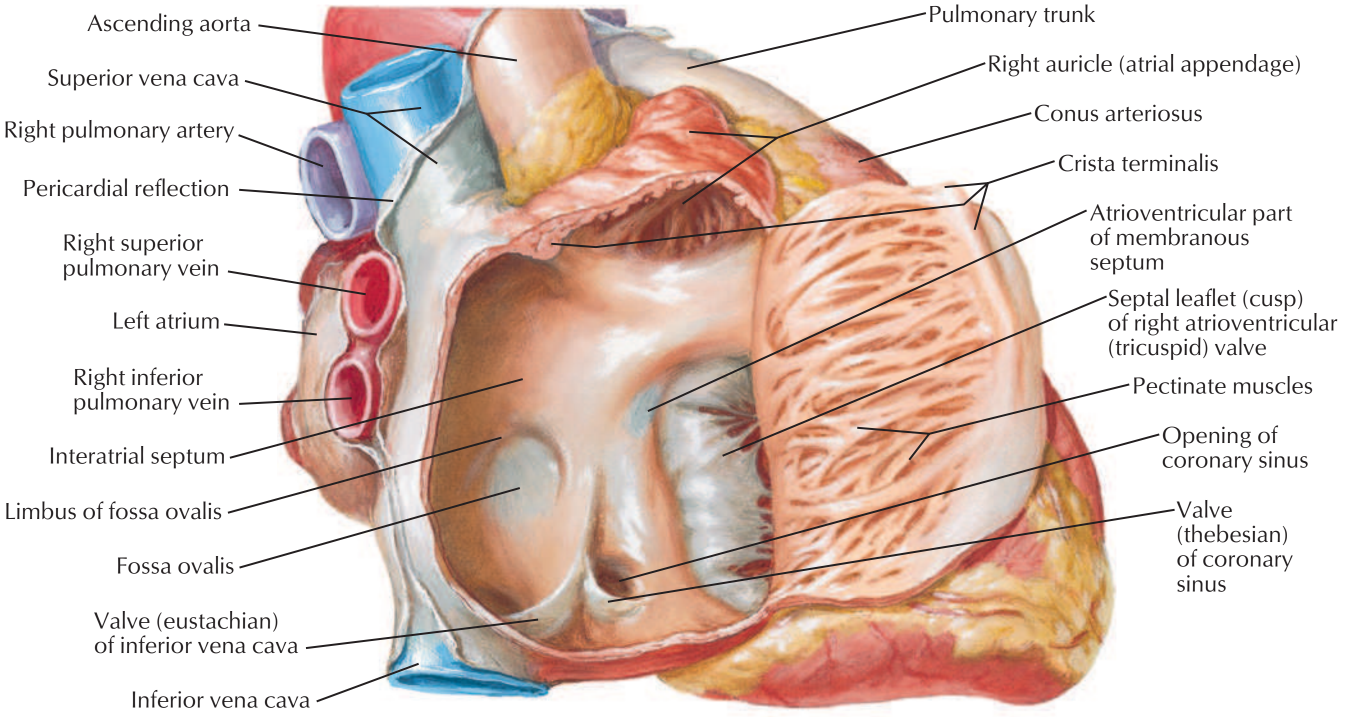

Right marginal artery
Right coronary artery
Left coronary artery
Circumflex branch
Aorta
Inferior interventricular branch
Anterior interventricular branch
Left ventricle


Left coronary artery
Circumflex branch
Anterior interventricular (left anterior descending) branch
Atrioventricular branch of circumflex branch
Left (obtuse) marginal branch
Posterolateral branches
(Perforating) interventricular septal branches
Diagonal branches of anterior interventricular branch

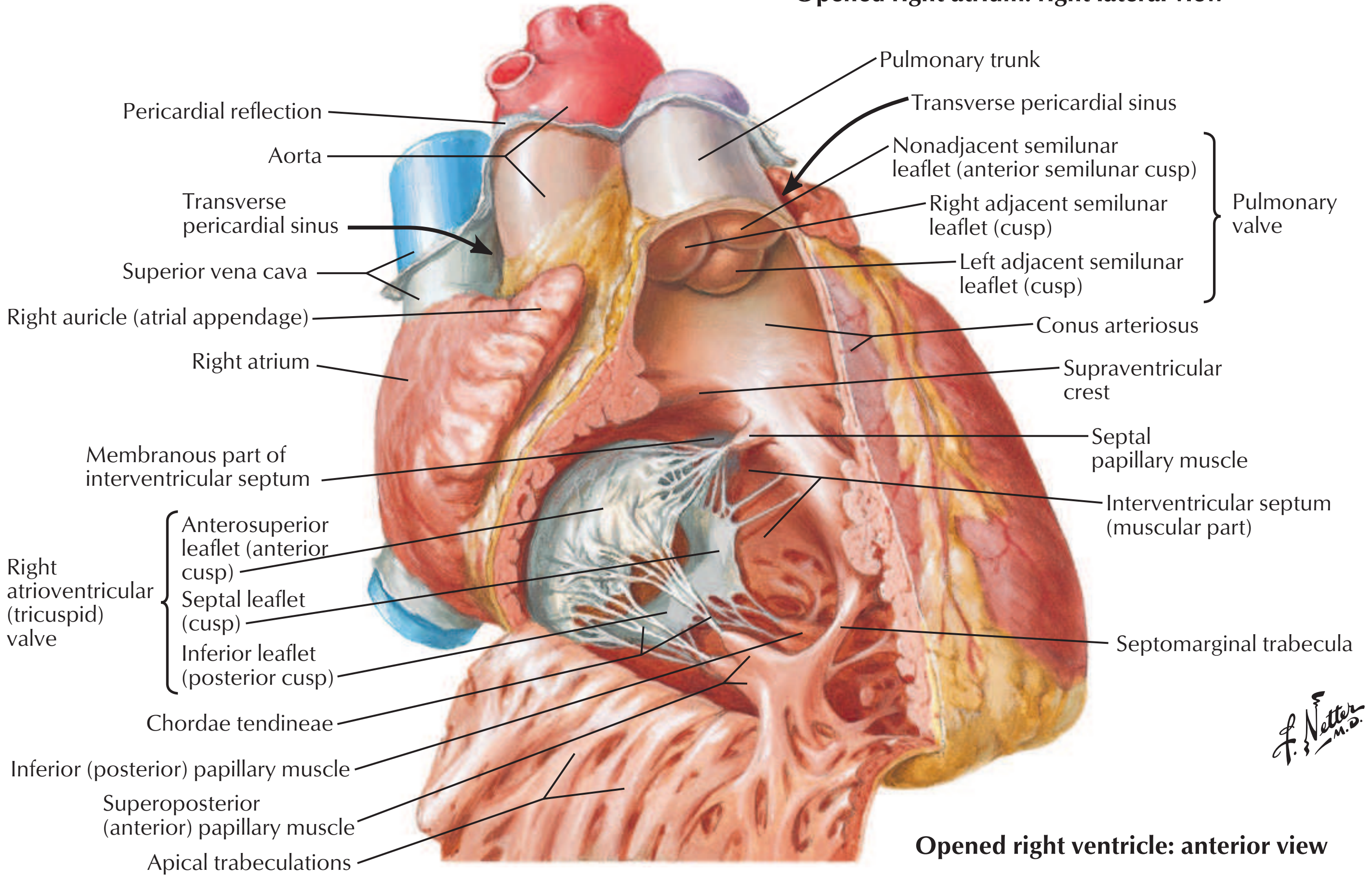

Right coronary artery
Left coronary artery
Left auricle
Aorta
Anterior interventricular branch
Left ventricle
Circumflex branch

Right Atrium and Ventricle



Ascending aorta
Superior vena cava
Right pulmonary artery
Pericardial reflection
Right superior pulmonary vein
Left atrium
Right inferior pulmonary vein
Interatrial septum
Limbus of fossa ovalis
Fossa ovalis
Valve (eustachian) of inferior vena cava
Inferior vena cava
Pulmonary trunk
Right auricle (atrial appendage)
Conus arteriosus
Crista terminalis
Atrioventricular part of membranous septum
Septal leaflet (cusp) of right atrioventricular (tricuspid) valve
Pectinate muscles
Opening of coronary sinus
Valve (thebesian) of coronary sinus

Opened right atrium: right lateral view



Pericardial reflection
Aorta
Transverse pericardial sinus
Superior vena cava
Right auricle (atrial appendage)
Right atrium
Membranous part of interventricular septum
Right atrioventricular (tricuspid) valve
Anterosuperior leaflet (anterior cusp)
Septal leaflet (cusp)
Inferior leaflet (posterior cusp)
Chordae tendineae
Inferior (posterior) papillary muscle
Superoposterior (anterior) papillary muscle
Apical trabeculations
Pulmonary trunk
Transverse pericardial sinus
Nonadjacent semilunar leaflet (anterior semilunar cusp)
Right adjacent semilunar leaflet (cusp)
Left adjacent semilunar leaflet (cusp)
Pulmonary valve
Conus arteriosus
Supraventricular crest
Septal papillary muscle
Interventricular septum (muscular part)
Septomarginal trabecula
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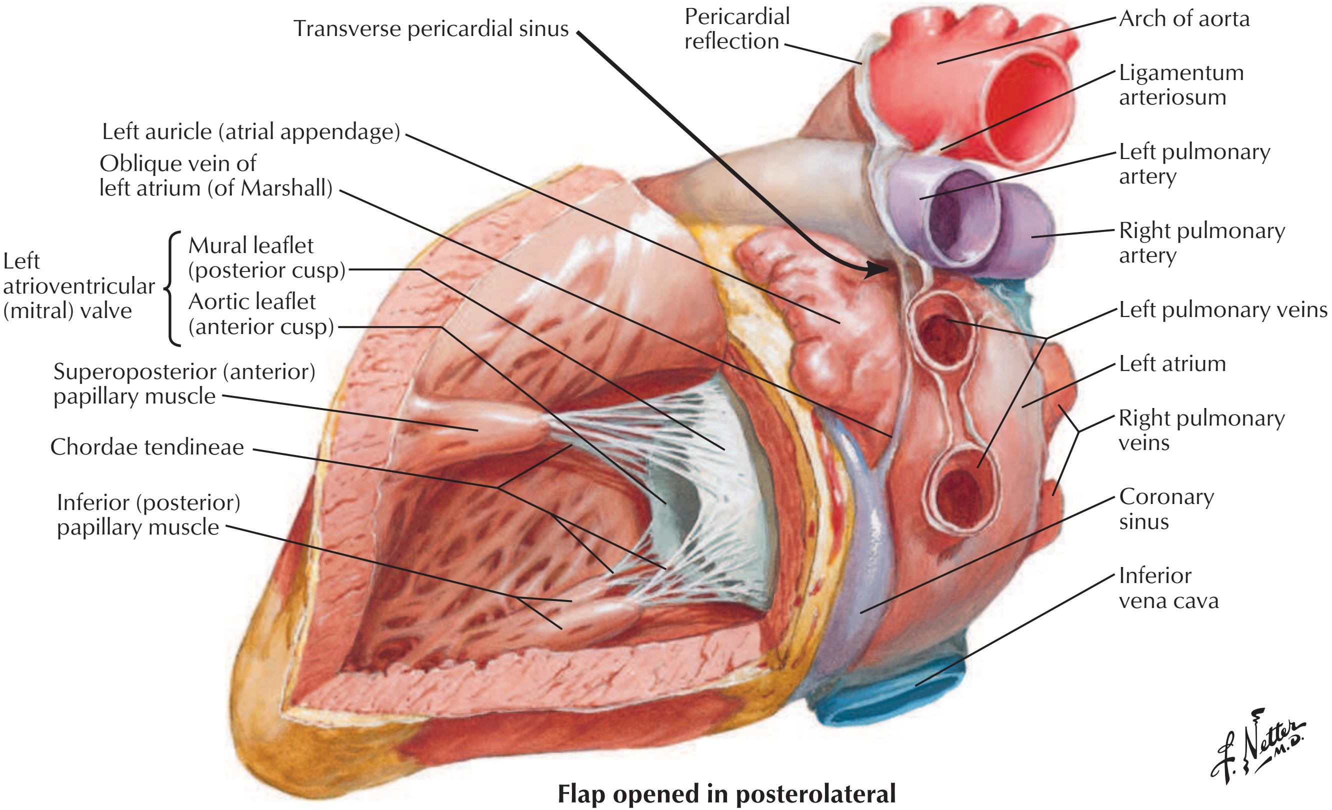
Opened right ventricle: anterior view


Transverse pericardial sinus
Pericardial reflection
Arch of aorta
Ligamentum arteriosum
Left pulmonary artery
Right pulmonary artery
Left pulmonary veins
Left atrium
Right pulmonary veins
Coronary sinus
Inferior vena cava
Left auricle (atrial appendage)
Oblique vein of left atrium (of Marshall)
Left atrioventricular (mitral) valve
Mural leaflet (posterior cusp)
Aortic leaflet (anterior cusp)
Superoposterior (anterior) papillary muscle
Chordae tendineae
Inferior (posterior) papillary muscle
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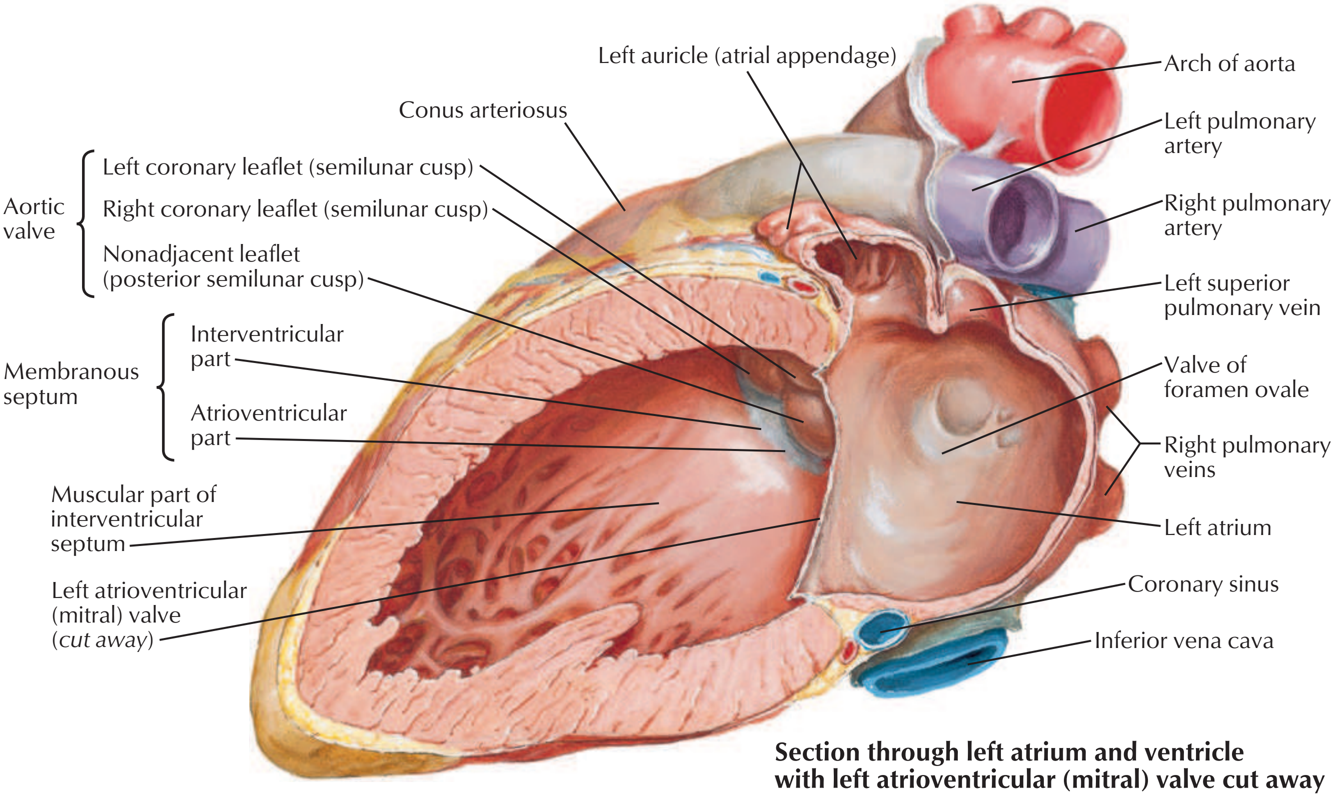
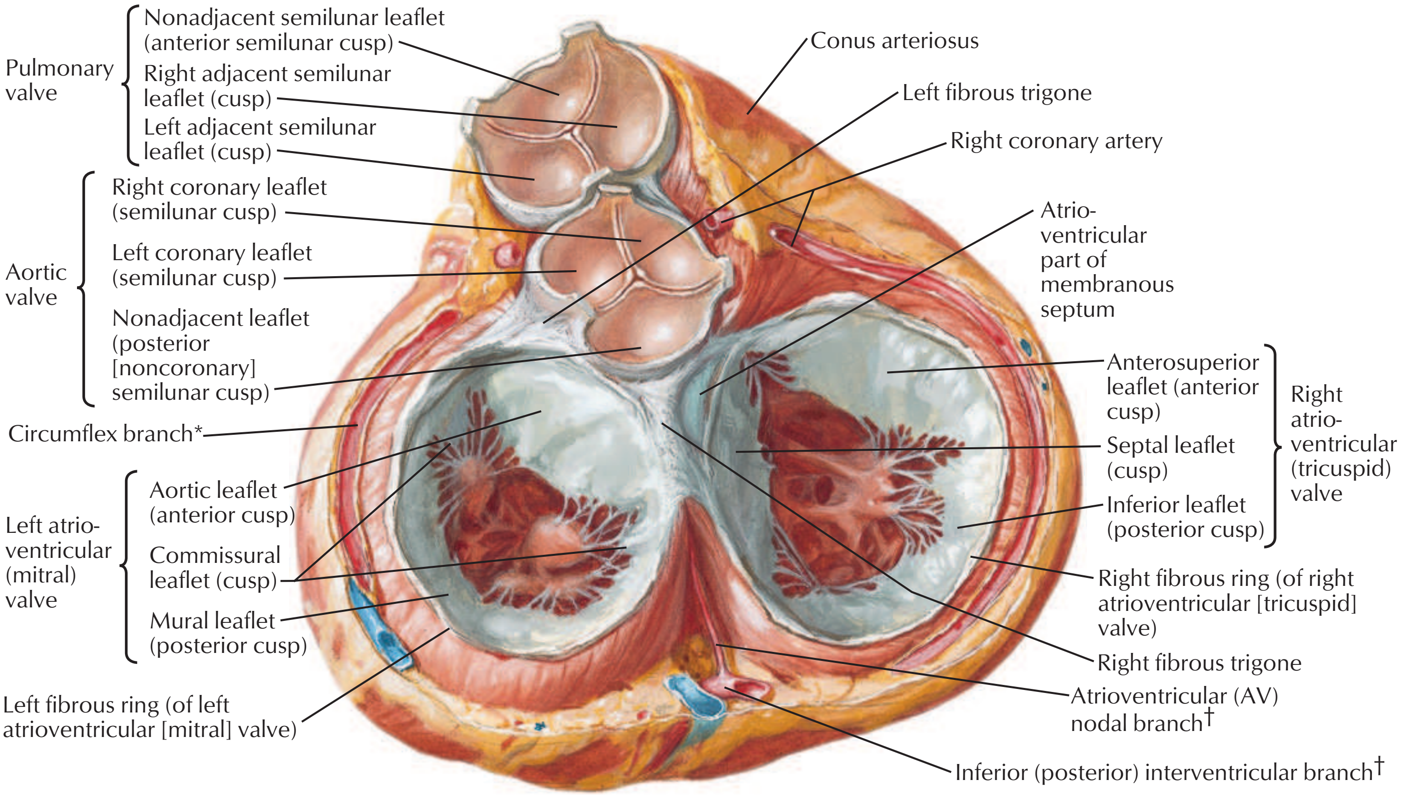
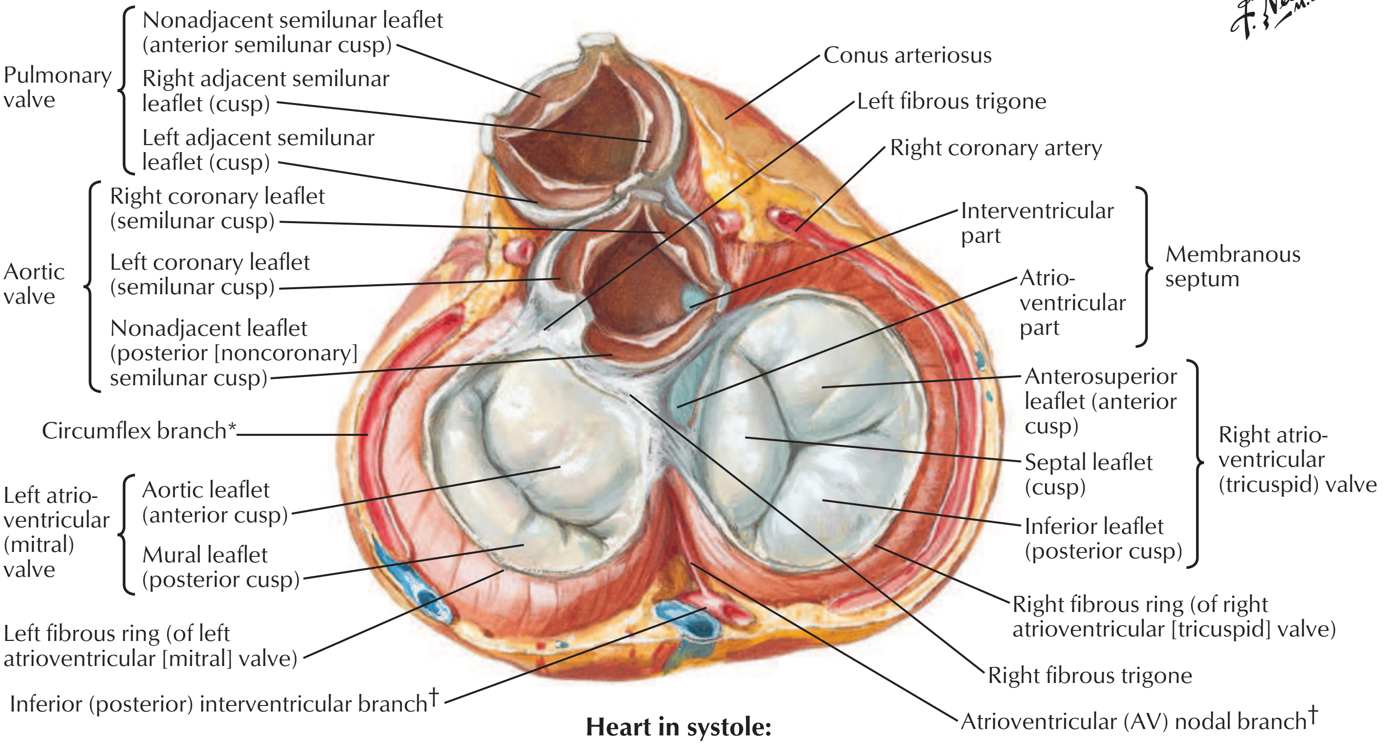
Flap opened in posterolateral wall of left ventricle


Left auricle (atrial appendage)
Conus arteriosus
Arch of aorta
Left pulmonary artery
Right pulmonary artery
Left superior pulmonary vein
Valve of foramen ovale
Right pulmonary veins
Left atrium
Coronary sinus
Inferior vena cava
Aortic valve
Left coronary leaflet (semilunar cusp)
Right coronary leaflet (semilunar cusp)
Nonadjacent leaflet (posterior semilunar cusp)
Membranous septum
Interventricular part
Atrioventricular part
Muscular part of interventricular septum
Left atrioventricular (mitral) valve (*cut away*)

Section through left atrium and ventricle with left atrioventricular (mitral) valve cut away

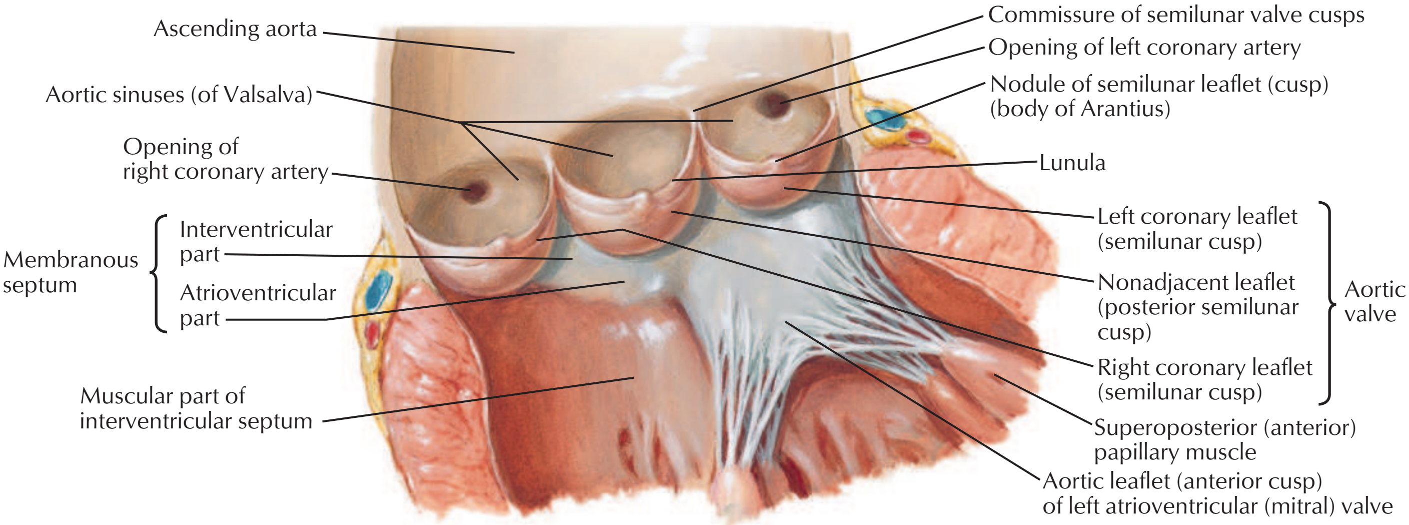

Pulmonary valve
Nonadjacent semilunar leaflet (anterior semilunar cusp)
Right adjacent semilunar leaflet (cusp)
Left adjacent semilunar leaflet (cusp)
Aortic valve
Right coronary leaflet (semilunar cusp)
Left coronary leaflet (semilunar cusp)
Nonadjacent leaflet (posterior [noncoronary] semilunar cusp)
Circumflex branch*
Left atrioventricular (mitral) valve
Aortic leaflet (anterior cusp)
Commissural leaflet (cusp)
Mural leaflet (posterior cusp)
Left fibrous ring (of left atrioventricular [mitral] valve)
Conus arteriosus
Left fibrous trigone
Right coronary artery
Atrioventricular part of membranous septum
Anterosuperior leaflet (anterior cusp)
Septal leaflet (cusp)
Inferior leaflet (posterior cusp)
Right atrioventricular (tricuspid) valve
Right fibrous ring (of right atrioventricular [tricuspid] valve)
Right fibrous trigone
Atrioventricular (AV) nodal branch†
Inferior (posterior) interventricular branch†

**Heart in diastole:
viewed from base with atria removed**

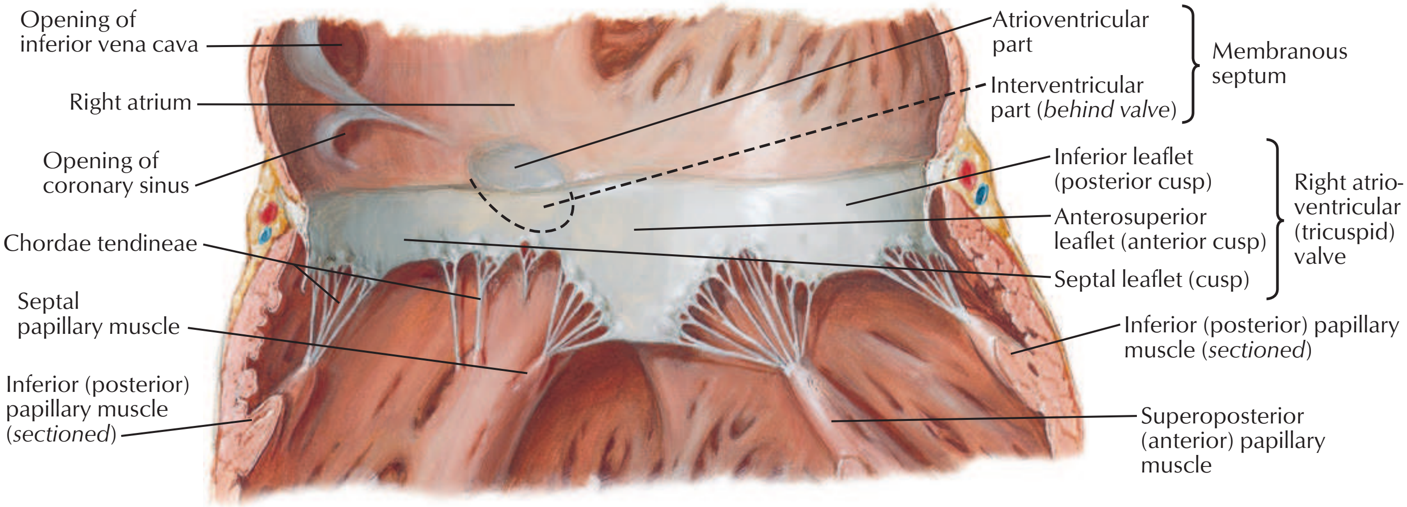

Pulmonary valve
Nonadjacent semilunar leaflet (anterior semilunar cusp)
Right adjacent semilunar leaflet (cusp)
Left adjacent semilunar leaflet (cusp)
Aortic valve
Right coronary leaflet (semilunar cusp)
Left coronary leaflet (semilunar cusp)
Nonadjacent leaflet (posterior [noncoronary] semilunar cusp)
Circumflex branch*
Left atrioventricular (mitral) valve
Aortic leaflet (anterior cusp)
Mural leaflet (posterior cusp)
Left fibrous ring (of left atrioventricular [mitral] valve)
Inferior (posterior) interventricular branch†
Conus arteriosus
Left fibrous trigone
Right coronary artery
Membranous septum
Interventricular part
Atrioventricular part
Anterosuperior leaflet (anterior cusp)
Septal leaflet (cusp)
Inferior leaflet (posterior cusp)
Right atrioventricular (tricuspid) valve
Right fibrous ring (of right atrioventricular [tricuspid] valve)
Right fibrous trigone
Atrioventricular (AV) nodal branch†

**Heart in systole:
viewed from base with atria removed**

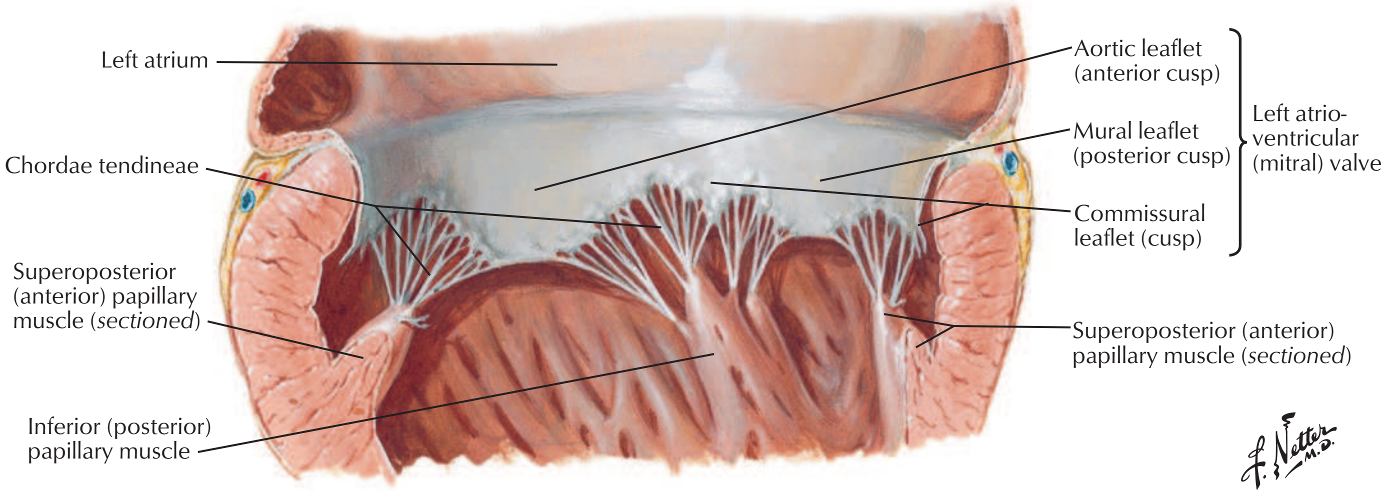
*Of left coronary artery
†Of right coronary artery


Ascending aorta
Aortic sinuses (of Valsalva)
Opening of right coronary artery
Membranous septum
Interventricular part
Atrioventricular part
Muscular part of interventricular septum
Commissure of semilunar valve cusps
Opening of left coronary artery
Nodule of semilunar leaflet (cusp) (body of Arantius)
Lunula
Left coronary leaflet (semilunar cusp)
Nonadjacent leaflet (posterior semilunar cusp)
Right coronary leaflet (semilunar cusp)
Aortic valve
Superoposterior (anterior) papillary muscle
Aortic leaflet (anterior cusp) of left atrioventricular (mitral) valve

Aortic valve

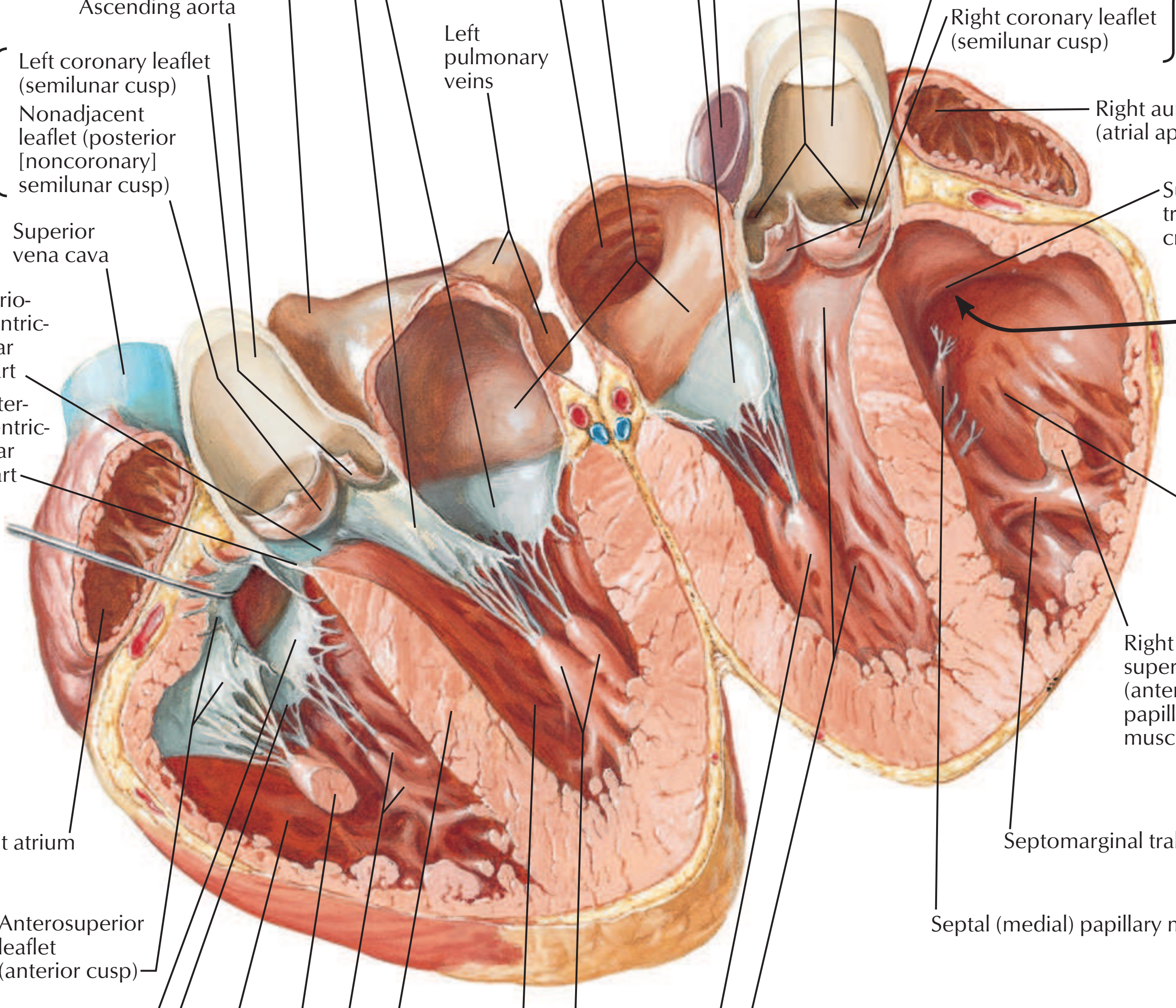

Opening of inferior vena cava
Right atrium
Opening of coronary sinus
Chordae tendineae
Septal papillary muscle
Inferior (posterior) papillary muscle (*sectioned*)
Atrioventricular part
Interventricular part (*behind valve*)
Membranous septum
Inferior leaflet (posterior cusp)
Anterosuperior leaflet (anterior cusp)
Septal leaflet (cusp)
Right atrioventricular (tricuspid) valve
Inferior (posterior) papillary muscle (*sectioned*)
Superoposterior (anterior) papillary muscle

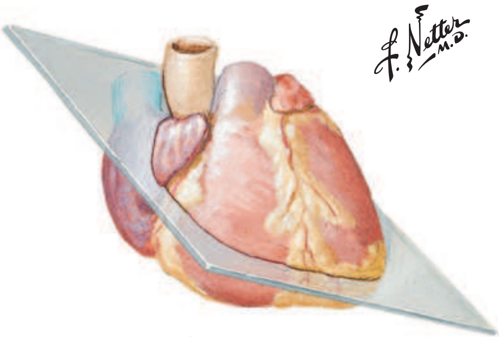
Right atrioventricular (tricuspid) valve


Left atrium
Chordae tendineae
Superoposterior (anterior) papillary muscle (*sectioned*)
Inferior (posterior) papillary muscle
Aortic leaflet (anterior cusp)
Mural leaflet (posterior cusp)
Commissural leaflet (cusp)
Left atrioventricular (mitral) valve
Superoposterior (anterior) papillary muscle (*sectioned*)

Left atrioventricular (mitral) valve

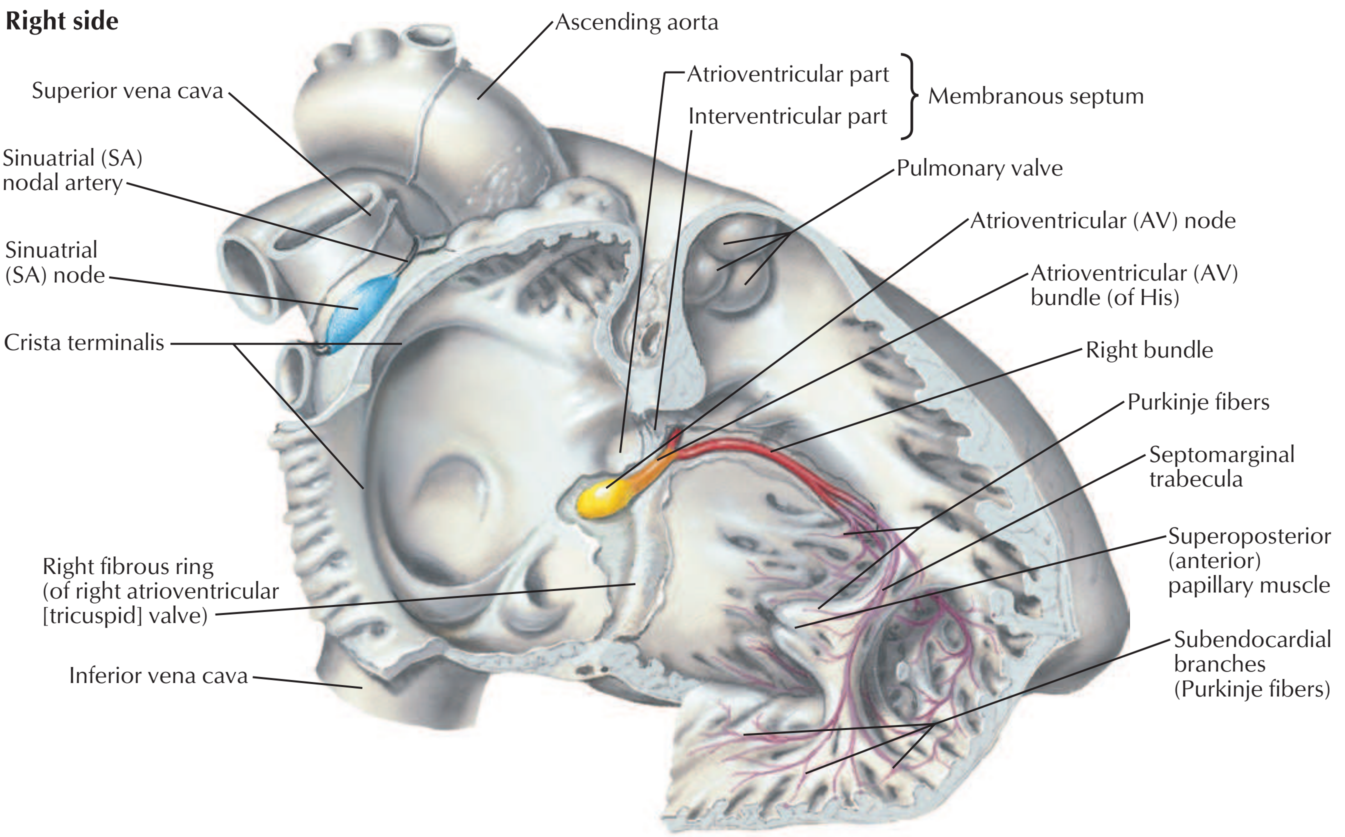
Atria, Ventricles, and Interventricular Septum


Pulmonary trunk
Openings of coronary arteries
Left atrioventricular (mitral) valve
Mural leaflet (posterior cusp)
Aortic leaflet (anterior cusp)
Aortic leaflet (anterior cusp) of left atrioventricular (mitral) valve
Ascending aorta
Left atrium
Right superior pulmonary vein
Left auricle (atrial appendage)
Left coronary leaflet (semilunar cusp)
Right coronary leaflet (semilunar cusp)
Aortic valve
Ascending aorta
Left pulmonary veins
Aortic valve
Left coronary leaflet (semilunar cusp)
Nonadjacent leaflet (posterior [noncoronary] semilunar cusp)
Right auricle (atrial appendage)
Superior vena cava
Supraventricular crest
Membranous septum
Atrioventricular part
Interventricular part
Outflow to pulmonary trunk
Right ventricle
Right superoposterior (anterior) papillary muscle (*cut*)
Right atrium
Septomarginal trabecula
Septal (medial) papillary muscle
Right atrioventricular (tricuspid) valve
Anterosuperior leaflet (anterior cusp)
Septal leaflet (cusp)
Inferior leaflet (posterior cusp)
Left ventricle
Right ventricle
Left inferior (posterior) papillary muscle
Right superoposterior (anterior) papillary muscle (*cut*)
Left superoposterior (anterior) papillary muscle
Right inferior (posterior) papillary muscle
Left ventricle
Muscular part of interventricular septum

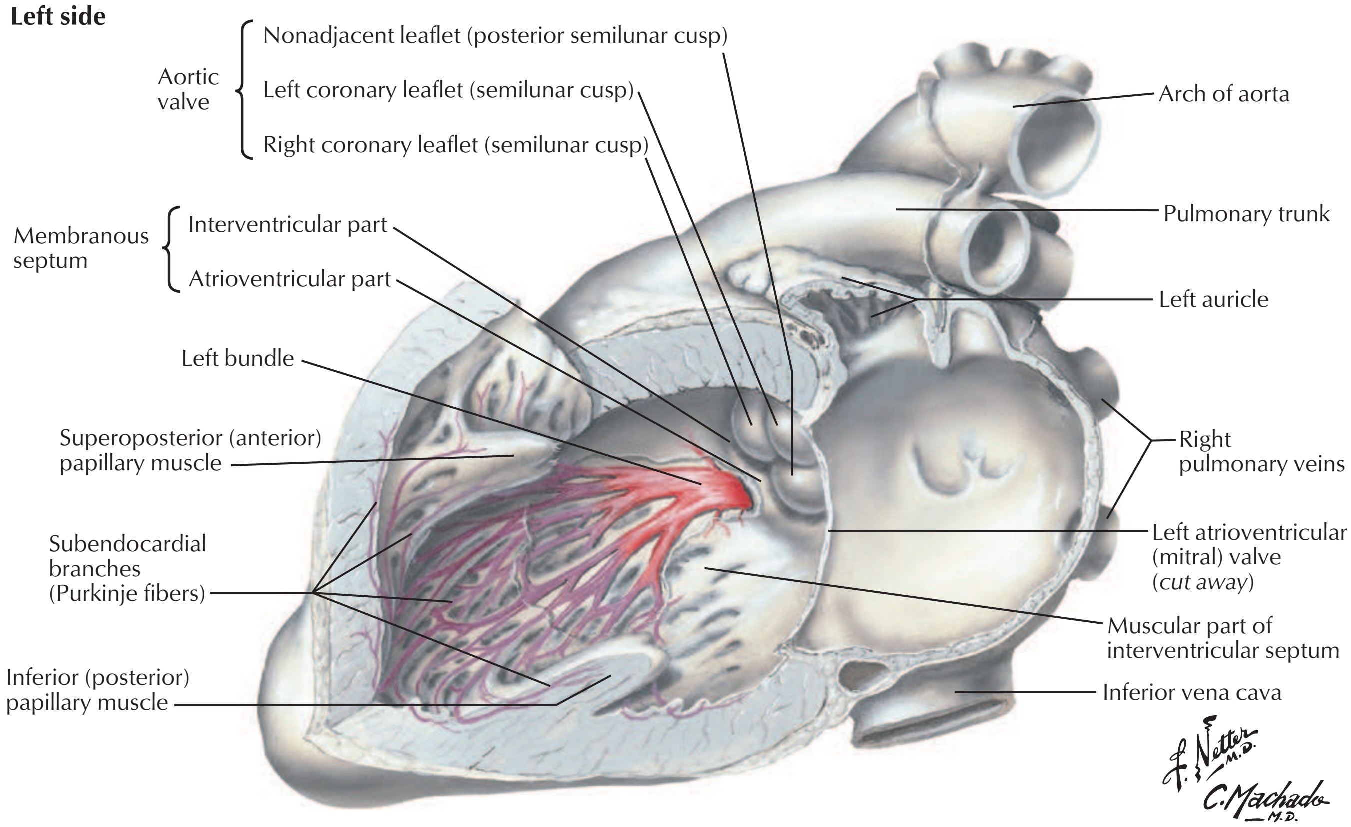


Plane of section

Right side


Ascending aorta
Superior vena cava
Atrioventricular part
Interventricular part
Membranous septum
Sinuatrial (SA) nodal artery
Pulmonary valve
Sinuatrial (SA) node
Atrioventricular (AV) node
Atrioventricular (AV) bundle (of His)
Crista terminalis
Right bundle
Purkinje fibers
Septomarginal trabecula
Superoposterior (anterior) papillary muscle
Right fibrous ring (of right atrioventricular [tricuspid] valve)
Subendocardial branches (Purkinje fibers)
Inferior vena cava

Left side


Aortic valve
Nonadjacent leaflet (posterior semilunar cusp)
Left coronary leaflet (semilunar cusp)
Right coronary leaflet (semilunar cusp)
Arch of aorta
Pulmonary trunk
Membranous septum
Interventricular part
Atrioventricular part
Left auricle
Left bundle
Superoposterior (anterior) papillary muscle
Right pulmonary veins
Left atrioventricular (mitral) valve (*cut away*)
Subendocardial branches (Purkinje fibers)
Muscular part of interventricular septum
Inferior (posterior) papillary muscle
Inferior vena cava
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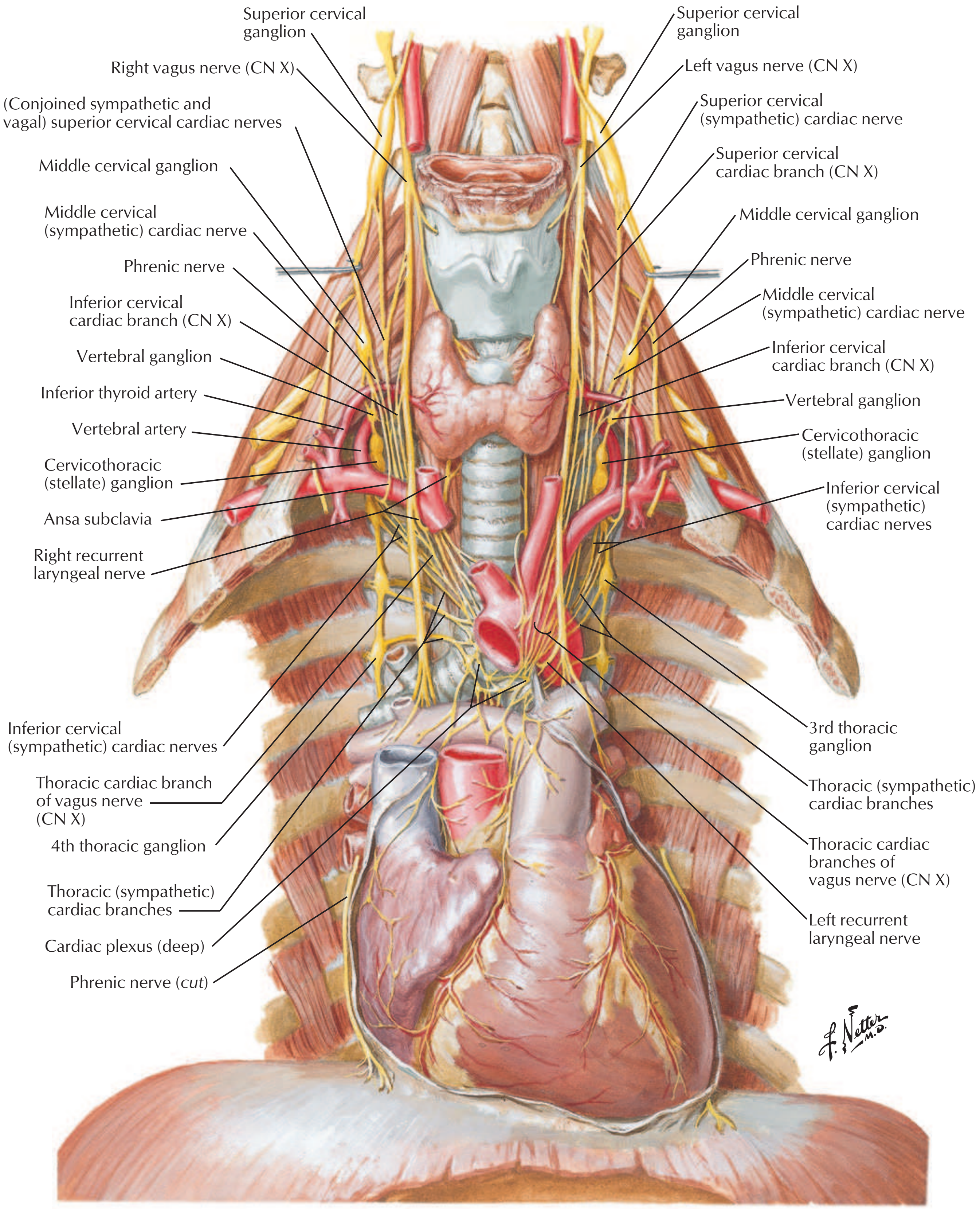
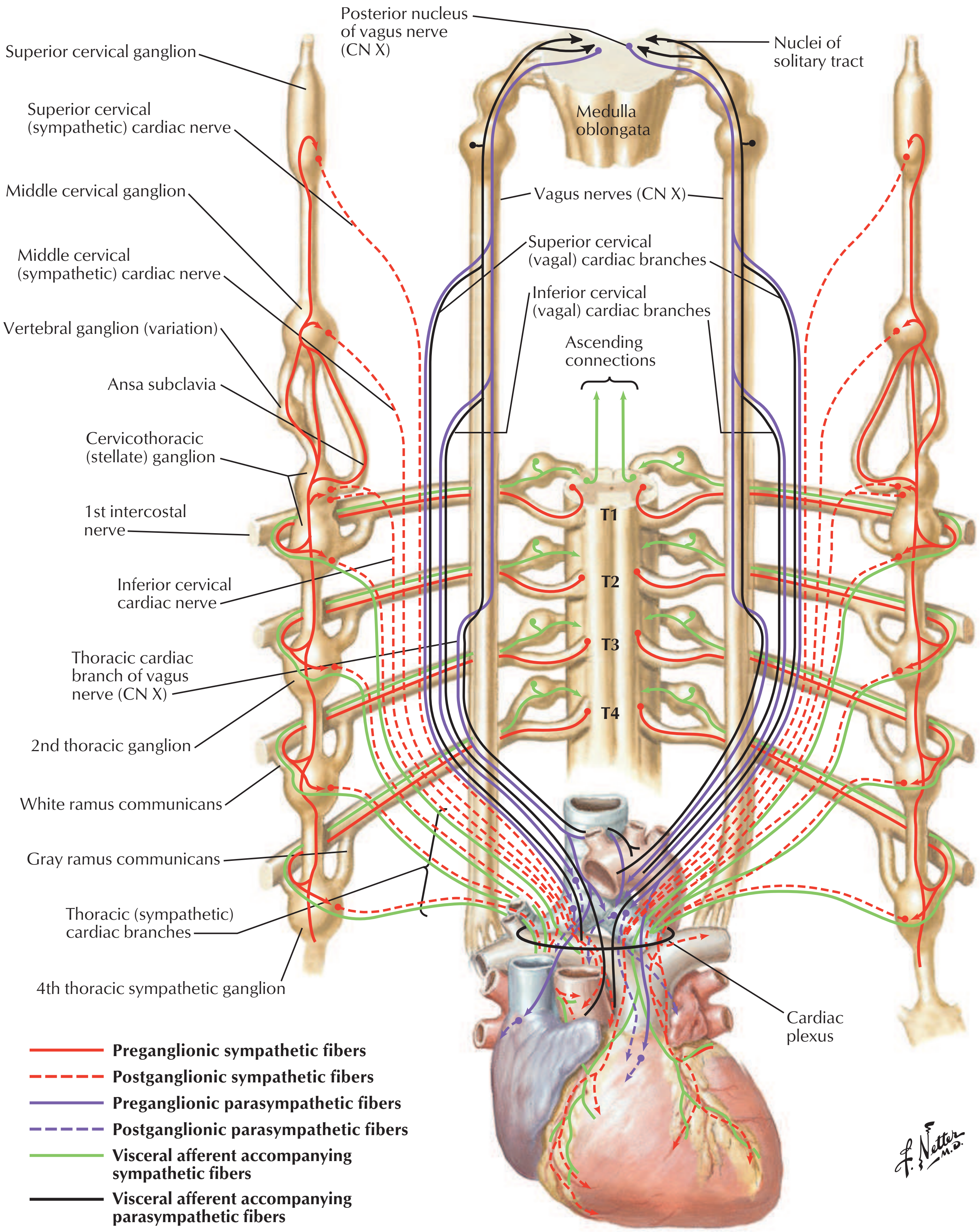
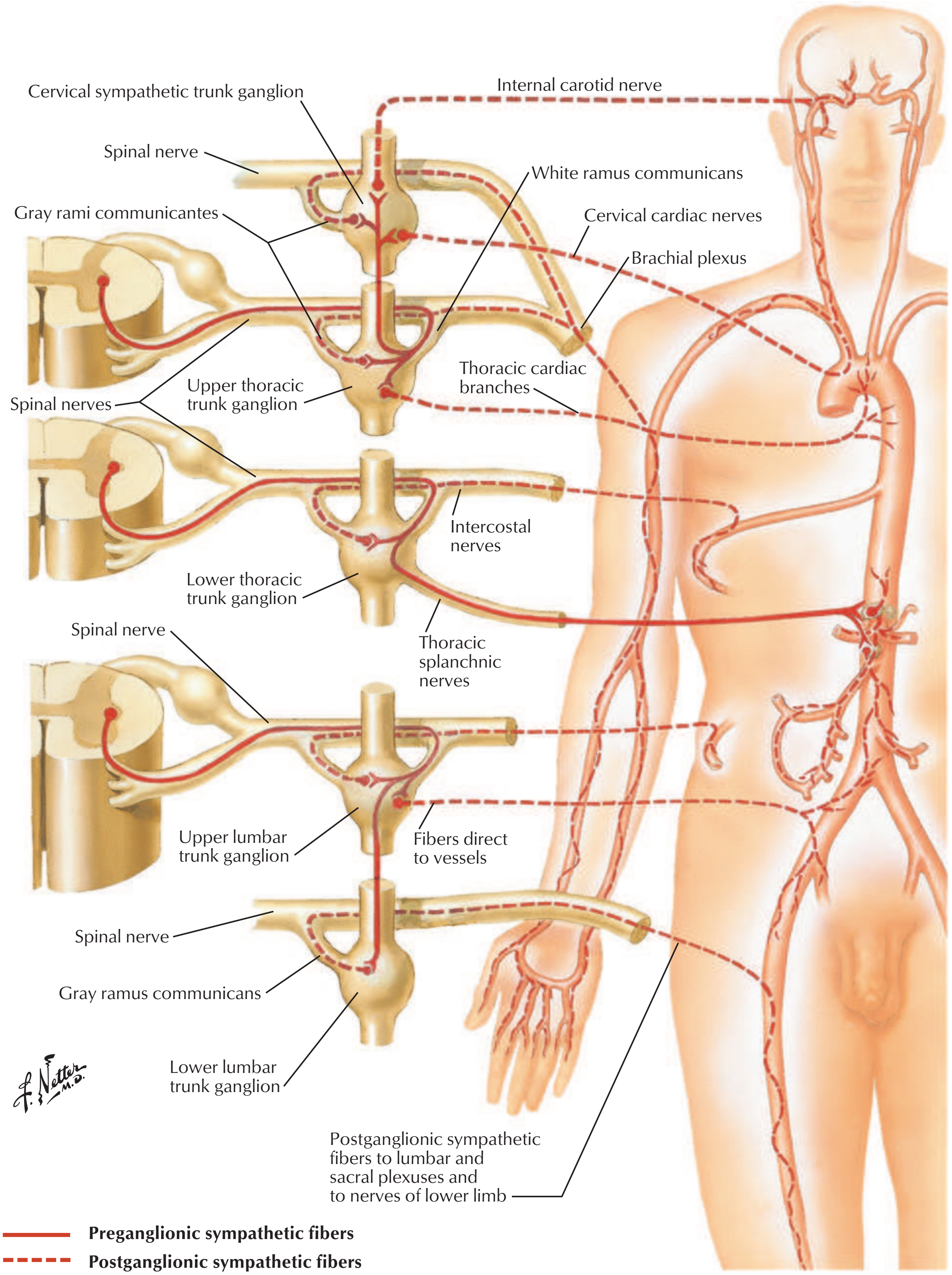
C. Machado M.D.

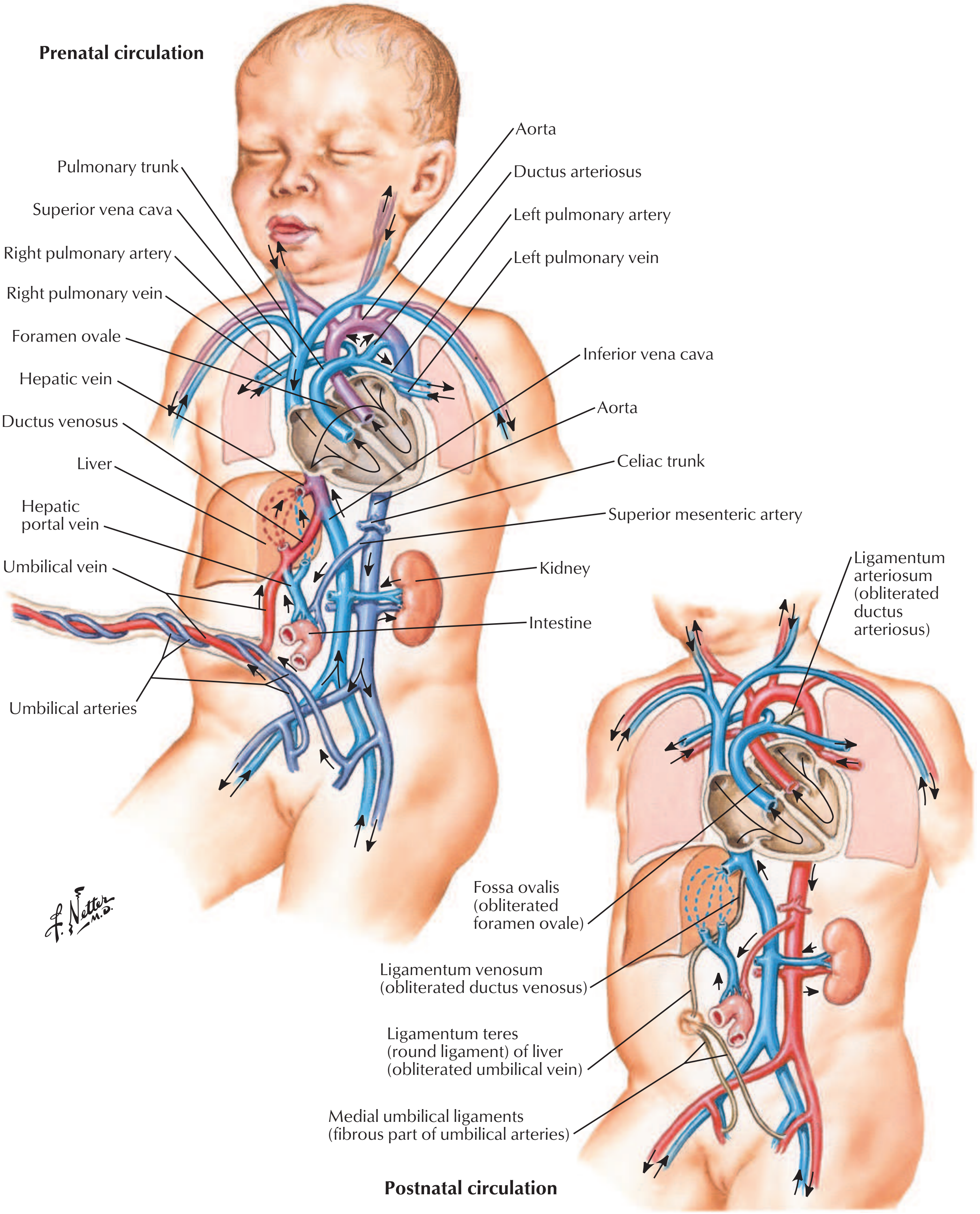

Superior cervical ganglion
Right vagus nerve (CN X)
(Conjoined sympathetic and vagal) superior cervical cardiac nerves
Middle cervical ganglion
Middle cervical (sympathetic) cardiac nerve
Phrenic nerve
Inferior cervical cardiac branch (CN X)
Vertebral ganglion
Inferior thyroid artery
Vertebral artery
Cervicothoracic (stellate) ganglion
Ansa subclavia
Right recurrent laryngeal nerve
Inferior cervical (sympathetic) cardiac nerves
Thoracic cardiac branch of vagus nerve (CN X)
4th thoracic ganglion
Thoracic (sympathetic) cardiac branches
Cardiac plexus (deep)
Phrenic nerve (cut)
Superior cervical ganglion
Left vagus nerve (CN X)
Superior cervical (sympathetic) cardiac nerve
Superior cervical cardiac branch (CN X)
Middle cervical ganglion
Phrenic nerve
Middle cervical (sympathetic) cardiac nerve
Inferior cervical cardiac branch (CN X)
Vertebral ganglion
Cervicothoracic (stellate) ganglion
Inferior cervical (sympathetic) cardiac nerves
3rd thoracic ganglion
Thoracic (sympathetic) cardiac branches
Thoracic cardiac branches of vagus nerve (CN X)
Left recurrent laryngeal nerve


Posterior nucleus of vagus nerve (CN X)
Nuclei of solitary tract
Superior cervical ganglion
Superior cervical (sympathetic) cardiac nerve
Medulla oblongata
Middle cervical ganglion
Vagus nerves (CN X)
Middle cervical (sympathetic) cardiac nerve
Superior cervical (vagal) cardiac branches
Inferior cervical (vagal) cardiac branches
Vertebral ganglion (variation)
Ascending connections
Ansa subclavia
Cervicothoracic (stellate) ganglion
1st intercostal nerve
T1
T2
Inferior cervical cardiac nerve
T3
Thoracic cardiac branch of vagus nerve (CN X)
T4
2nd thoracic ganglion
White ramus communicans
Gray ramus communicans
Thoracic (sympathetic) cardiac branches
4th thoracic sympathetic ganglion
Cardiac plexus
Preganglionic sympathetic fibers
Postganglionic sympathetic fibers
Preganglionic parasympathetic fibers
Postganglionic parasympathetic fibers
Visceral afferent accompanying sympathetic fibers
Visceral afferent accompanying parasympathetic fibers


Cervical sympathetic trunk ganglion
Internal carotid nerve
Spinal nerve
White ramus communicans
Gray rami communicantes
Cervical cardiac nerves
Brachial plexus
Spinal nerves
Upper thoracic trunk ganglion
Thoracic cardiac branches
Intercostal nerves
Lower thoracic trunk ganglion
Spinal nerve
Thoracic splanchnic nerves
Upper lumbar trunk ganglion
Fibers direct to vessels
Spinal nerve
Gray ramus communicans
Lower lumbar trunk ganglion
Postganglionic sympathetic fibers to lumbar and sacral plexuses and to nerves of lower limb

— **Preganglionic sympathetic fibers**

- - - **Postganglionic sympathetic fibers**

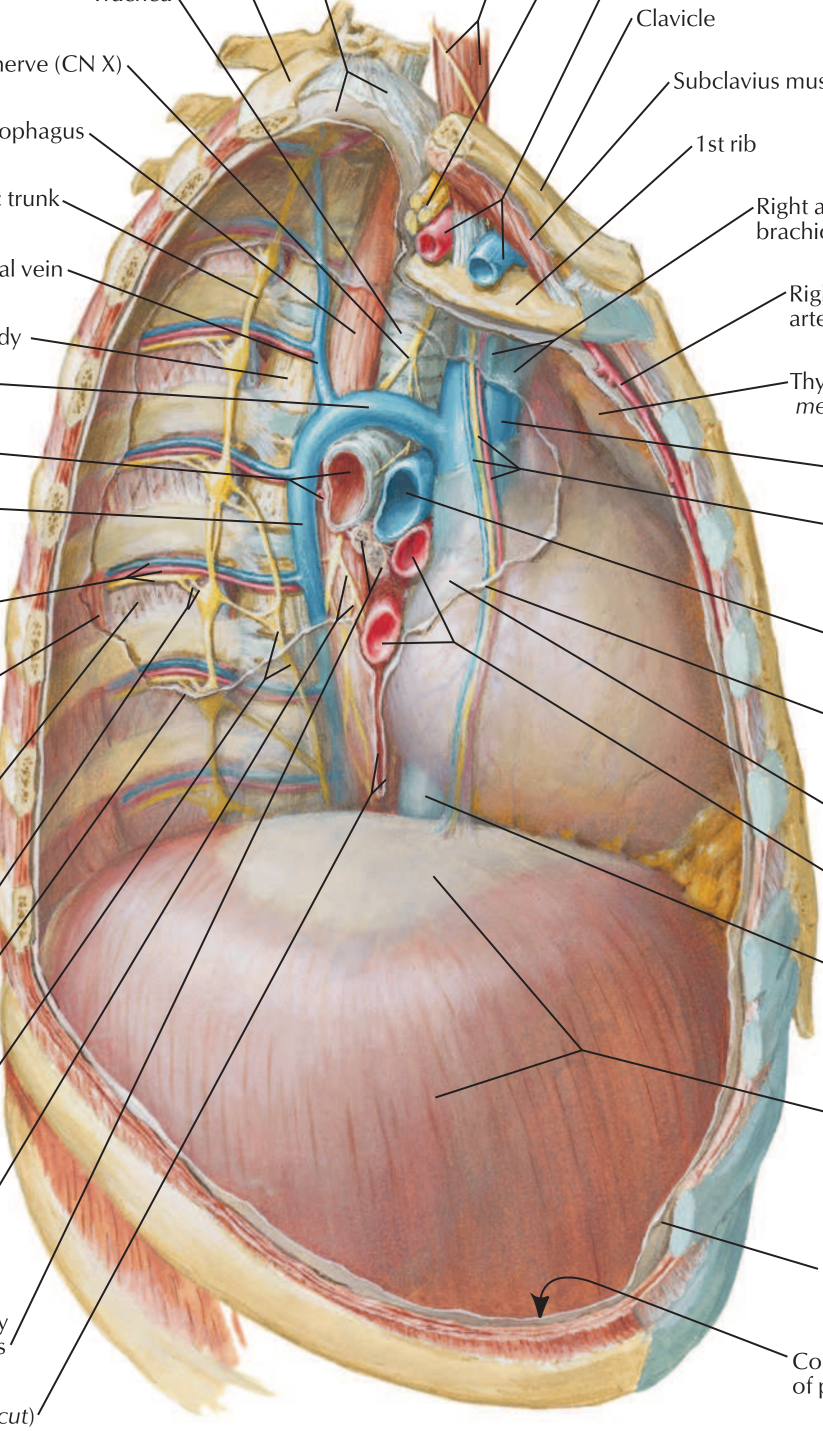


Prenatal circulation

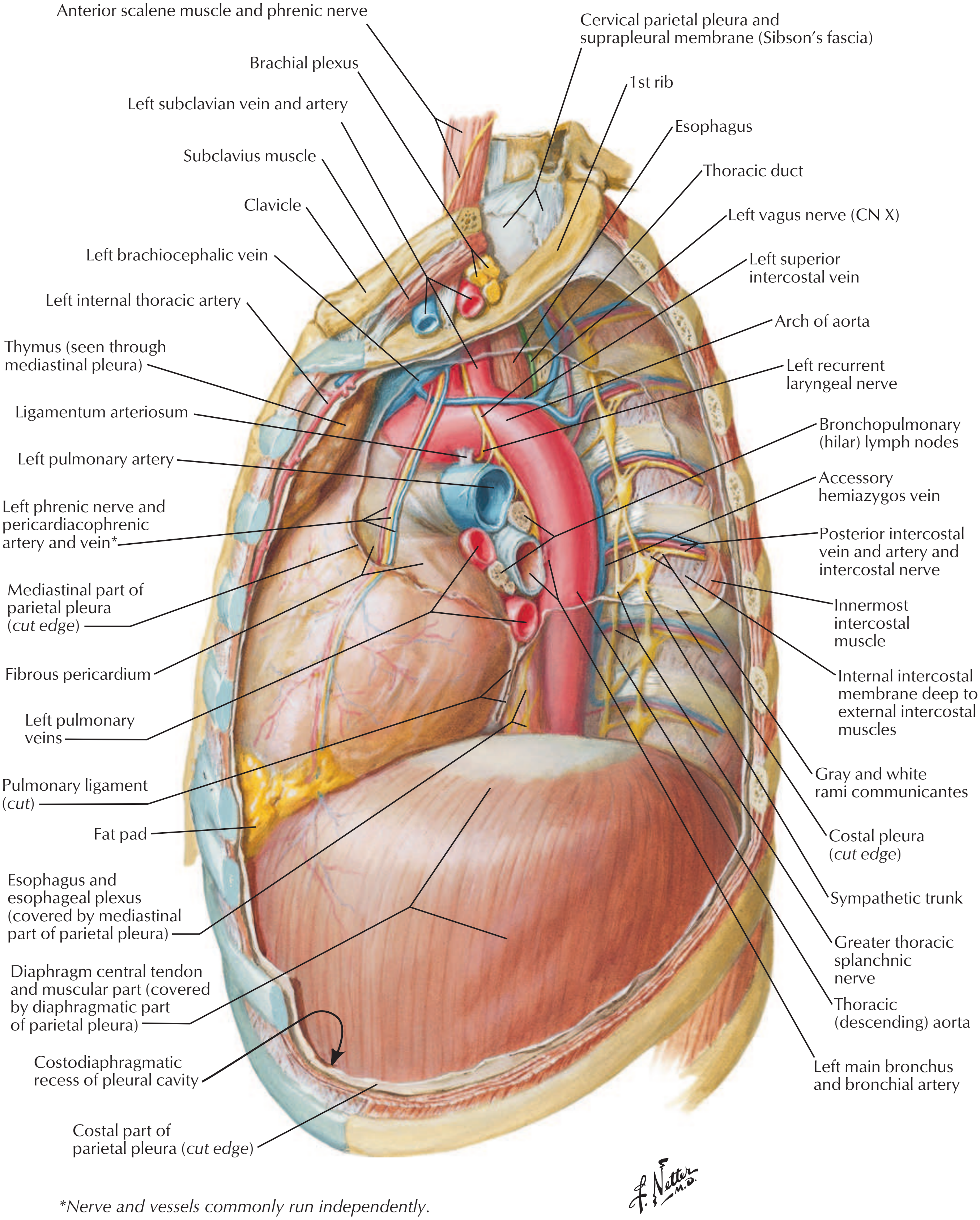
Pulmonary trunk
Superior vena cava
Right pulmonary artery
Right pulmonary vein
Foramen ovale
Hepatic vein
Ductus venosus
Liver
Hepatic portal vein
Umbilical vein
Umbilical arteries
Aorta
Ductus arteriosus
Left pulmonary artery
Left pulmonary vein
Inferior vena cava
Aorta
Celiac trunk
Superior mesenteric artery
Kidney
Intestine

Postnatal circulation

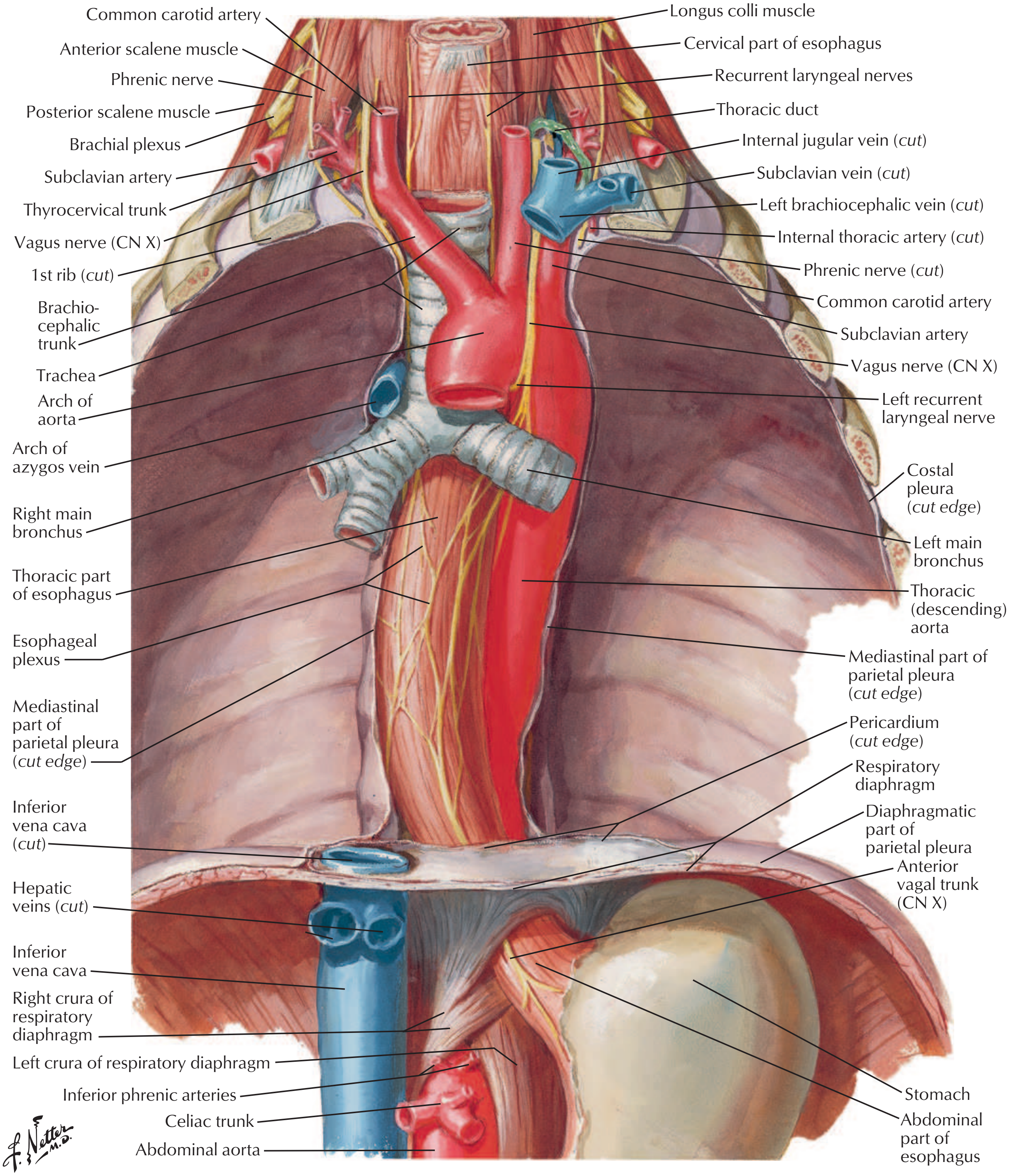
Ligamentum arteriosum (obliterated ductus arteriosus)
Fossa ovalis (obliterated foramen ovale)
Ligamentum venosum (obliterated ductus venosus)
Ligamentum teres (round ligament) of liver (obliterated umbilical vein)
Medial umbilical ligaments (fibrous part of umbilical arteries)


Cervical parietal pleura and suprapleural membrane (Sibson's fascia)
1st rib
Trachea
Right vagus nerve (CN X)
Esophagus
Sympathetic trunk
Right superior intercostal vein
4th thoracic vertebral body
Arch of azygos vein
Right main bronchus and bronchial artery
Azygos vein
Posterior intercostal vein and artery and intercostal nerve
Innermost intercostal muscles
Internal intercostal membrane deep to external intercostal muscles
Gray and white rami communicantes
Costal part of parietal pleura (*cut edge*)
Greater thoracic splanchnic nerve
Esophagus and esophageal plexus
Bronchopulmonary (hilar) lymph nodes
Pulmonary ligament (*cut*)
Anterior scalene muscle and phrenic nerve
Brachial plexus
Right subclavian artery and vein
Clavicle
Subclavius muscle
1st rib
Right and left brachiocephalic veins
Right internal thoracic artery
Thymus (*seen through mediastinal pleura*)
Superior vena cava
Phrenic nerve and pericardiacophrenic artery and vein*
Right pulmonary artery
Mediastinal part of parietal pleura (*cut edge*)
Fibrous pericardium over right atrium
Right pulmonary veins
Inferior vena cava (covered by mediastinal part of parietal pleura)
Respiratory diaphragm central tendon and muscular part (covered by diaphragmatic part of parietal pleura)
Costal part of parietal pleura (*cut edge*)
Costodiaphragmatic recess of pleural cavity

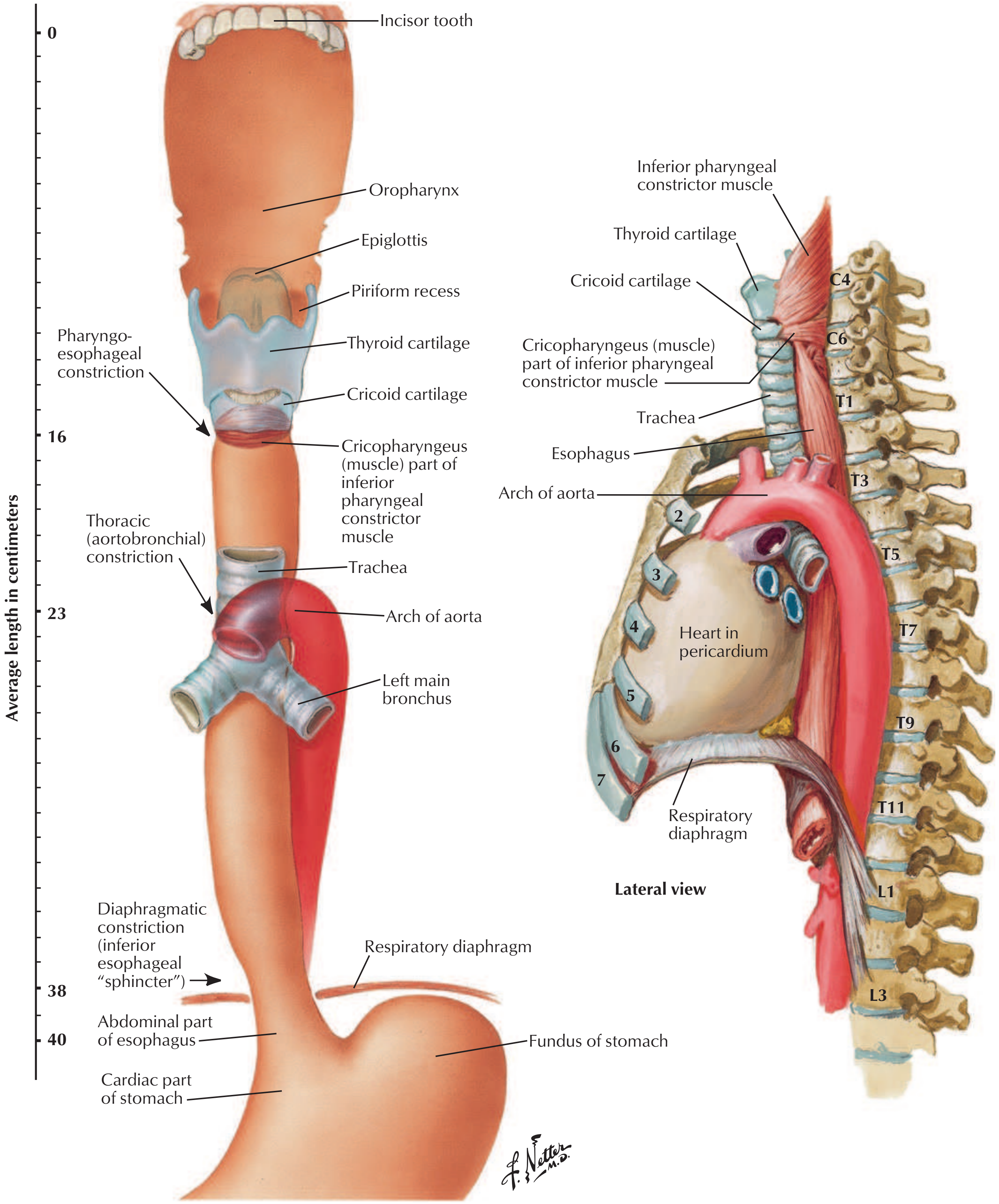
Nerve and vessels commonly run independently.


Anterior scalene muscle and phrenic nerve
Brachial plexus
Left subclavian vein and artery
Subclavius muscle
Clavicle
Left brachiocephalic vein
Left internal thoracic artery
Thymus (seen through mediastinal pleura)
Ligamentum arteriosum
Left pulmonary artery
Left phrenic nerve and pericardiacophrenic artery and vein*
Mediastinal part of parietal pleura (*cut edge*)
Fibrous pericardium
Left pulmonary veins
Pulmonary ligament (*cut*)
Fat pad
Esophagus and esophageal plexus (covered by mediastinal part of parietal pleura)
Diaphragm central tendon and muscular part (covered by diaphragmatic part of parietal pleura)
Costodiaphragmatic recess of pleural cavity
Costal part of parietal pleura (*cut edge*)
Cervical parietal pleura and suprapleural membrane (Sibson's fascia)
1st rib
Esophagus
Thoracic duct
Left vagus nerve (CN X)
Left superior intercostal vein
Arch of aorta
Left recurrent laryngeal nerve
Bronchopulmonary (hilar) lymph nodes
Accessory hemiazygos vein
Posterior intercostal vein and artery and intercostal nerve
Innermost intercostal muscle
Internal intercostal membrane deep to external intercostal muscles
Gray and white rami communicantes
Costal pleura (*cut edge*)
Sympathetic trunk
Greater thoracic splanchnic nerve
Thoracic (descending) aorta
Left main bronchus and bronchial artery
F. Netter M.D.

**Nerve and vessels commonly run independently.*

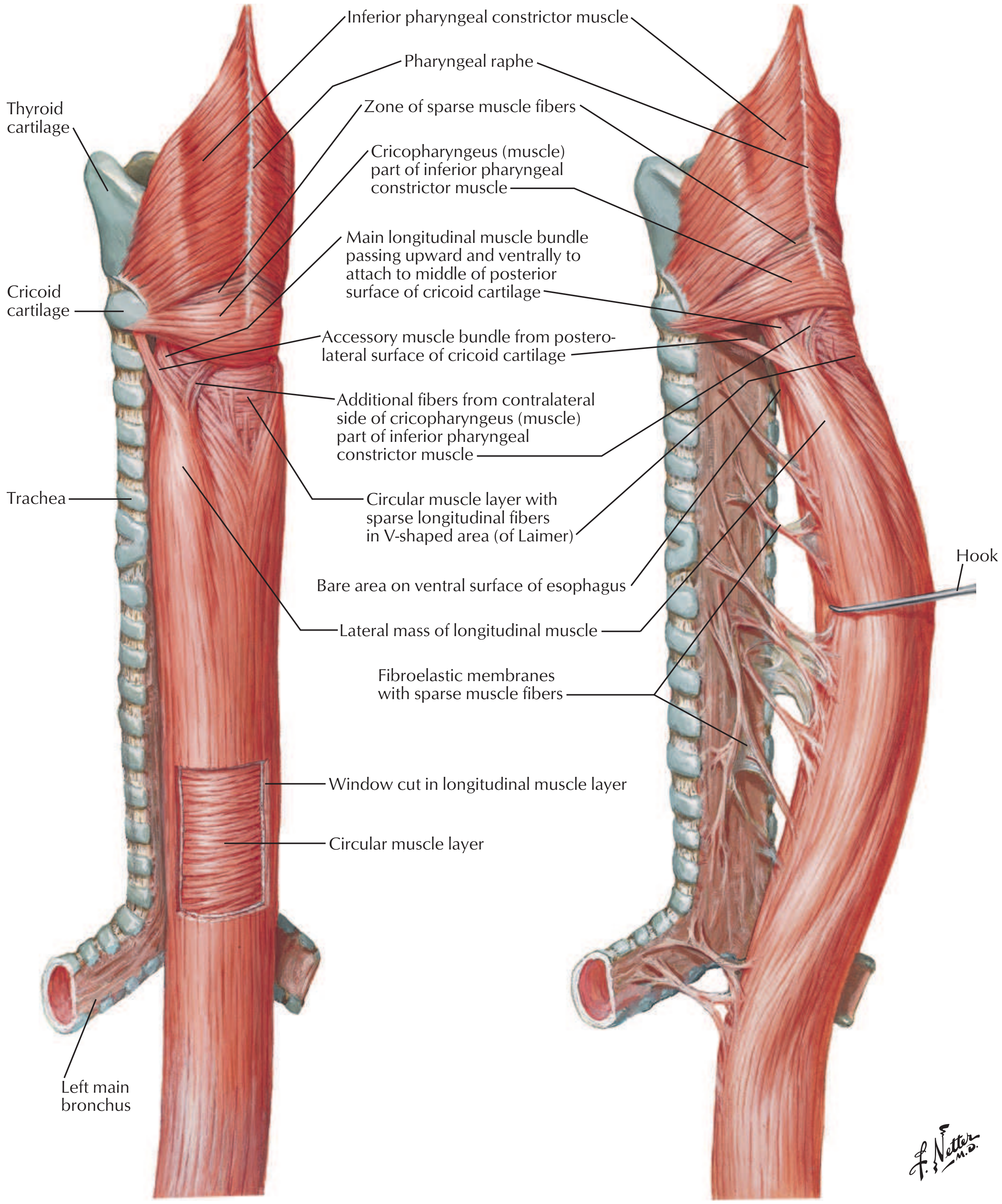

Common carotid artery
Anterior scalene muscle
Phrenic nerve
Posterior scalene muscle
Brachial plexus
Subclavian artery
Thyrocervical trunk
Vagus nerve (CN X)
1st rib (*cut*)
Brachio-cephalic trunk
Trachea
Arch of aorta
Arch of azygos vein
Right main bronchus
Thoracic part of esophagus
Esophageal plexus
Mediastinal part of parietal pleura (*cut edge*)
Inferior vena cava (*cut*)
Hepatic veins (*cut*)
Inferior vena cava
Right crura of respiratory diaphragm
Left crura of respiratory diaphragm
Inferior phrenic arteries
Celiac trunk
Abdominal aorta
Longus colli muscle
Cervical part of esophagus
Recurrent laryngeal nerves
Thoracic duct
Internal jugular vein (*cut*)
Subclavian vein (*cut*)
Left brachiocephalic vein (*cut*)
Internal thoracic artery (*cut*)
Phrenic nerve (*cut*)
Common carotid artery
Subclavian artery
Vagus nerve (CN X)
Left recurrent laryngeal nerve
Costal pleura (*cut edge*)
Left main bronchus
Thoracic (descending) aorta
Mediastinal part of parietal pleura (*cut edge*)
Pericardium (*cut edge*)
Respiratory diaphragm
Diaphragmatic part of parietal pleura
Anterior vagal trunk (CN X)
Stomach
Abdominal part of esophagus

Topography and Constrictions of Esophagus


Average length in centimeters
0
16
23
38
40
Incisor tooth
Oropharynx
Epiglottis
Piriform recess
Thyroid cartilage
Cricoid cartilage
Pharyngo-esophageal constriction
Cricopharyngeus (muscle) part of inferior pharyngeal constrictor muscle
Thoracic (aortobronchial) constriction
Trachea
Arch of aorta
Left main bronchus
Diaphragmatic constriction (inferior esophageal "sphincter")
Respiratory diaphragm
Abdominal part of esophagus
Cardiac part of stomach
Fundus of stomach
Inferior pharyngeal constrictor muscle
Thyroid cartilage
Cricoid cartilage
Cricopharyngeus (muscle) part of inferior pharyngeal constrictor muscle
Trachea
Esophagus
Arch of aorta
Heart in pericardium
Respiratory diaphragm
C4
C6
T1
T3
T5
T7
T9
T11
L1
L3
2
3
4
5
6
7

Lateral view

See also Plates 75, 81


Inferior pharyngeal constrictor muscle
Pharyngeal raphe
Zone of sparse muscle fibers
Thyroid cartilage
Cricopharyngeus (muscle) part of inferior pharyngeal constrictor muscle
Main longitudinal muscle bundle passing upward and ventrally to attach to middle of posterior surface of cricoid cartilage
Cricoid cartilage
Accessory muscle bundle from postero-lateral surface of cricoid cartilage
Additional fibers from contralateral side of cricopharyngeus (muscle) part of inferior pharyngeal constrictor muscle
Trachea
Circular muscle layer with sparse longitudinal fibers in V-shaped area (of Laimer)
Hook
Bare area on ventral surface of esophagus
Lateral mass of longitudinal muscle
Fibroelastic membranes with sparse muscle fibers
Window cut in longitudinal muscle layer
Circular muscle layer
Left main bronchus
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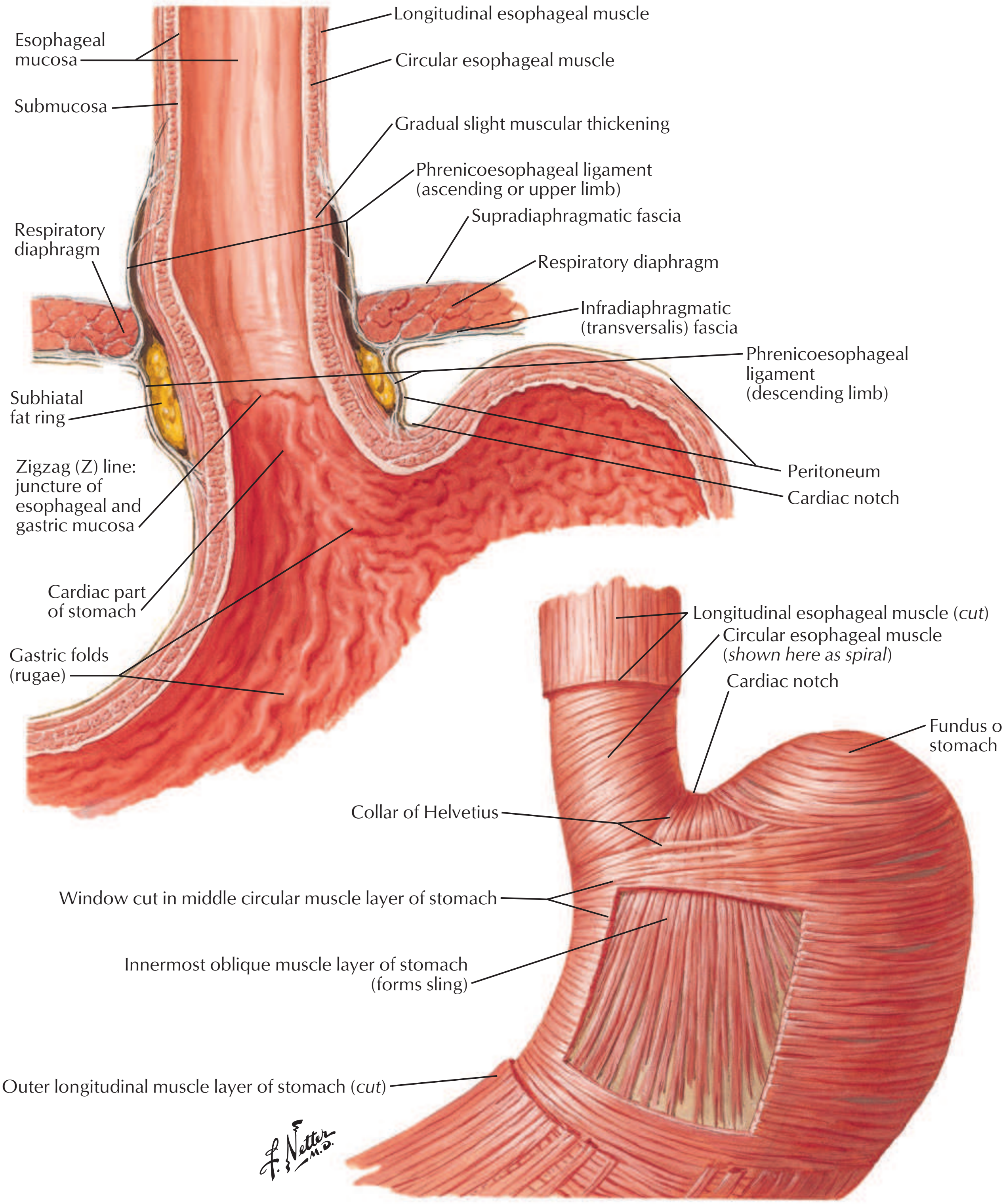
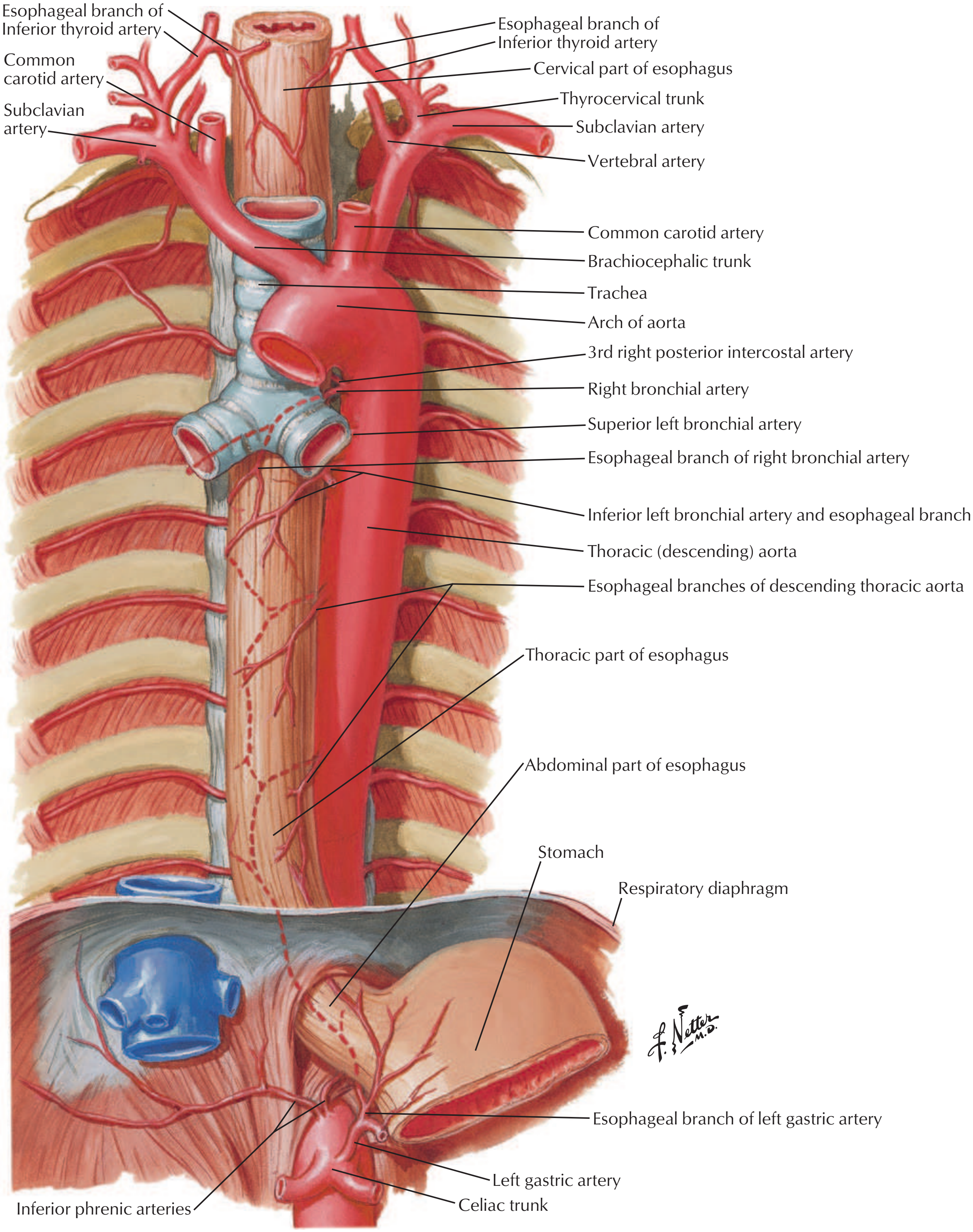
Posterolateral view

Esophagogastric Junction

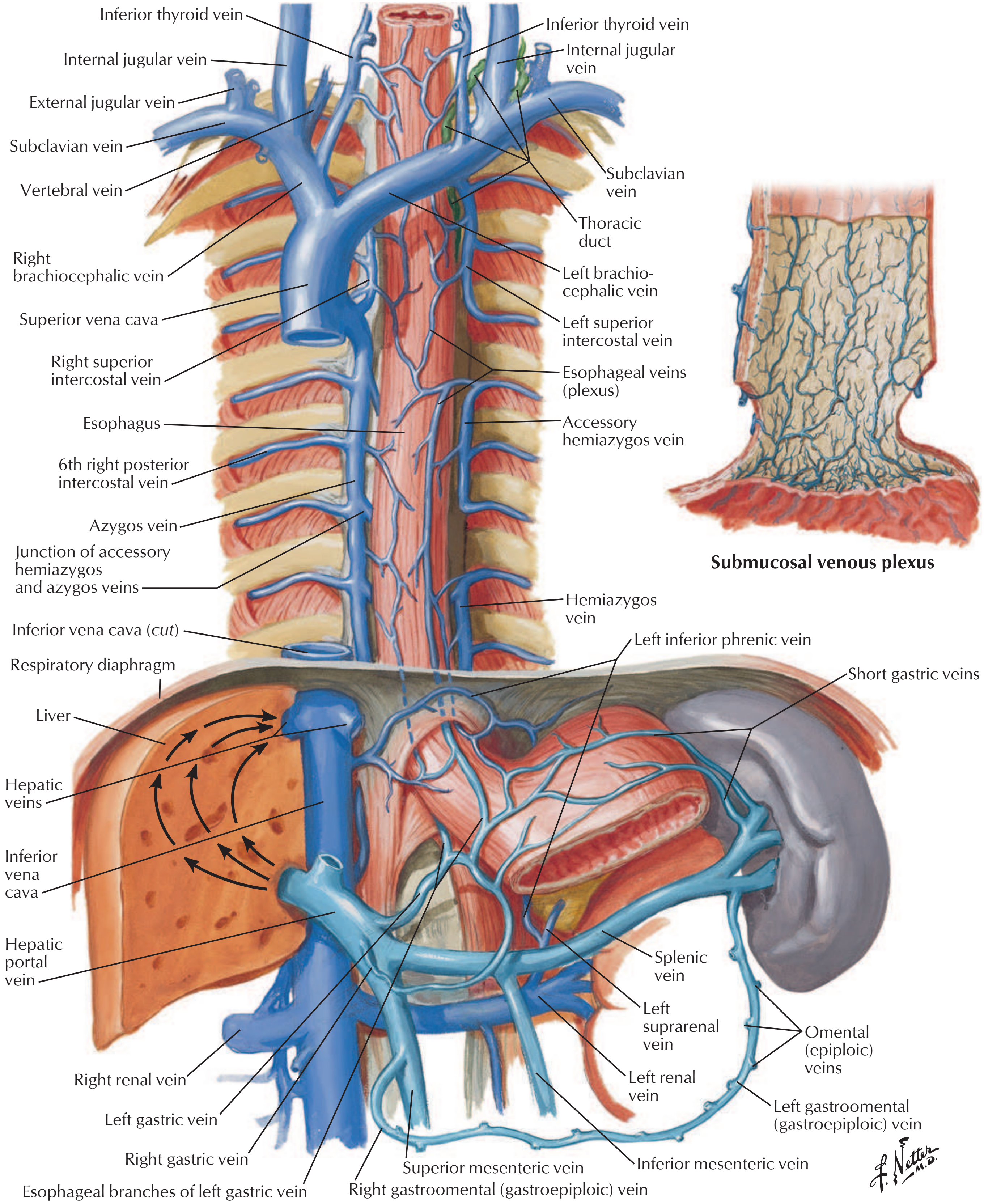

Longitudinal esophageal muscle
Esophageal mucosa
Circular esophageal muscle
Submucosa
Gradual slight muscular thickening
Phrenicoesophageal ligament (ascending or upper limb)
Supradiaphragmatic fascia
Respiratory diaphragm
Respiratory diaphragm
Infradiaphragmatic (transversalis) fascia
Phrenicoesophageal ligament (descending limb)
Subhiatal fat ring
Peritoneum
Cardiac notch
Zigzag (Z) line: juncture of esophageal and gastric mucosa
Cardiac part of stomach
Gastric folds (rugae)
Longitudinal esophageal muscle (*cut*)
Circular esophageal muscle (*shown here as spiral*)
Cardiac notch
Fundus of stomach
Collar of Helvetius
Window cut in middle circular muscle layer of stomach
Innermost oblique muscle layer of stomach (forms sling)
Outer longitudinal muscle layer of stomach (*cut*)

See also Plates 211, 291


Esophageal branch of
Inferior thyroid artery
Common
carotid artery
Subclavian
artery
Esophageal branch of
Inferior thyroid artery
Cervical part of esophagus
Thyrocervical trunk
Subclavian artery
Vertebral artery
Common carotid artery
Brachiocephalic trunk
Trachea
Arch of aorta
3rd right posterior intercostal artery
Right bronchial artery
Superior left bronchial artery
Esophageal branch of right bronchial artery
Inferior left bronchial artery and esophageal branch
Thoracic (descending) aorta
Esophageal branches of descending thoracic aorta
Thoracic part of esophagus
Abdominal part of esophagus
Stomach
Respiratory diaphragm
Esophageal branch of left gastric artery
Left gastric artery
Celiac trunk
Inferior phrenic arteries

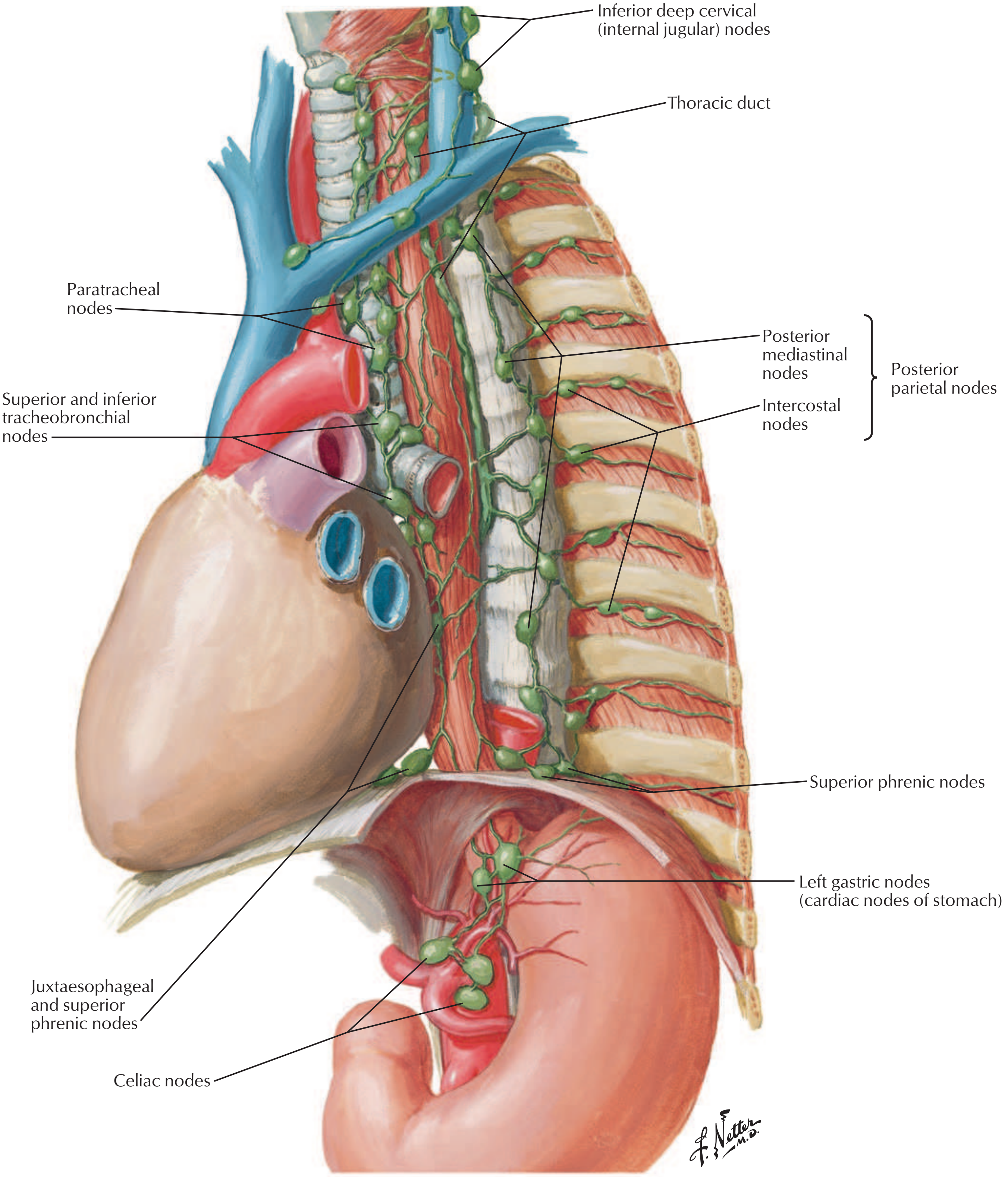
Veins of Esophagus

See also **Plate 198**

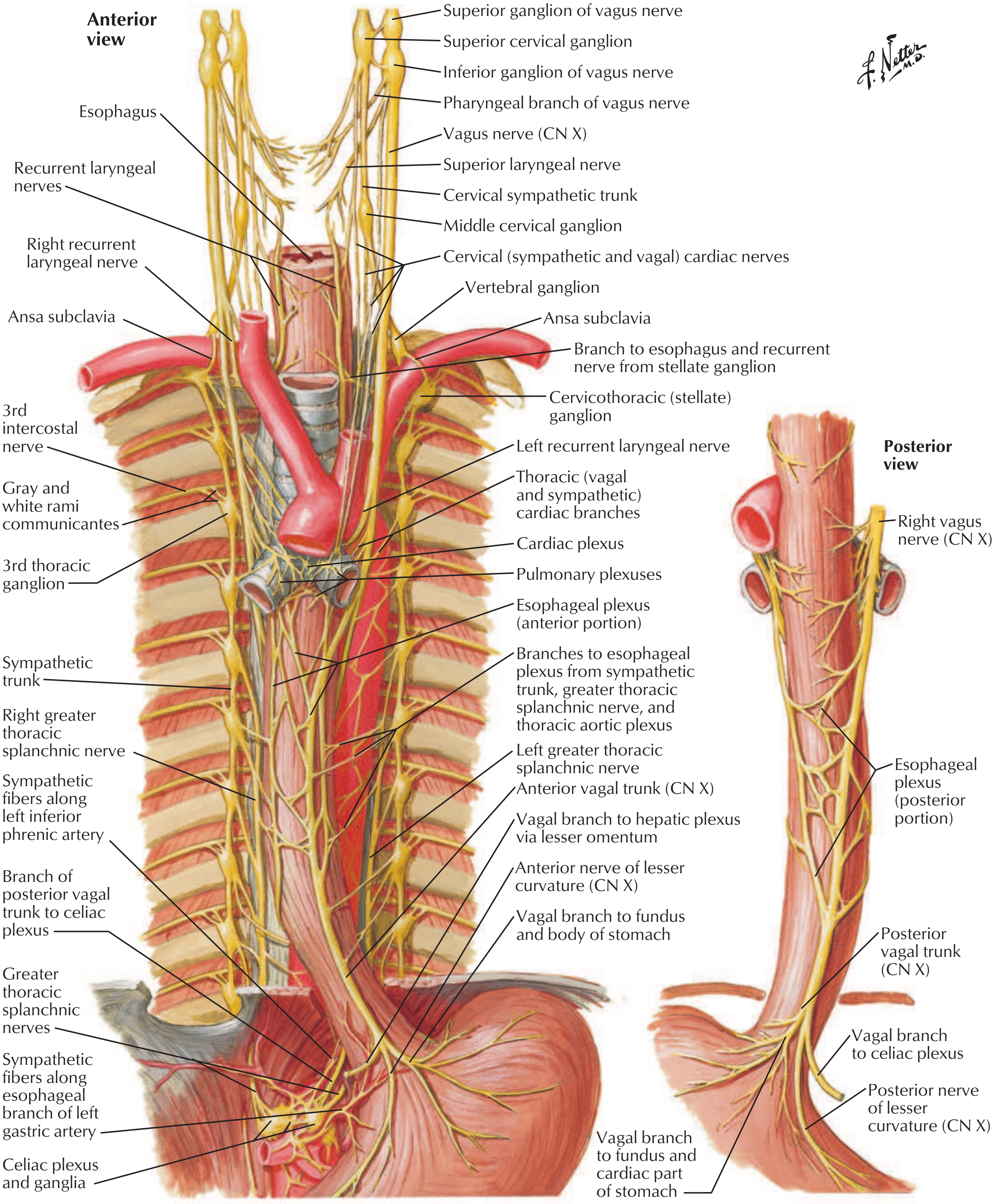

Inferior thyroid vein
Internal jugular vein
External jugular vein
Subclavian vein
Vertebral vein
Right brachiocephalic vein
Superior vena cava
Right superior intercostal vein
Esophagus
6th right posterior intercostal vein
Azygos vein
Junction of accessory hemiazygos and azygos veins
Inferior vena cava (*cut*)
Respiratory diaphragm
Liver
Hepatic veins
Inferior vena cava
Hepatic portal vein
Right renal vein
Left gastric vein
Right gastric vein
Esophageal branches of left gastric vein
Inferior thyroid vein
Internal jugular vein
Subclavian vein
Thoracic duct
Left brachio-cephalic vein
Left superior intercostal vein
Esophageal veins (plexus)
Accessory hemiazygos vein
Hemiazygos vein
Left inferior phrenic vein
Short gastric veins
Splenic vein
Left suprarenal vein
Left renal vein
Omental (epiploic) veins
Left gastroomental (gastroepiploic) vein
Inferior mesenteric vein
Superior mesenteric vein
Right gastroomental (gastroepiploic) vein
Submucosal venous plexus
F. Netter M.D.

Lymph Vessels and Nodes of Esophagus

See also **Plate 212**

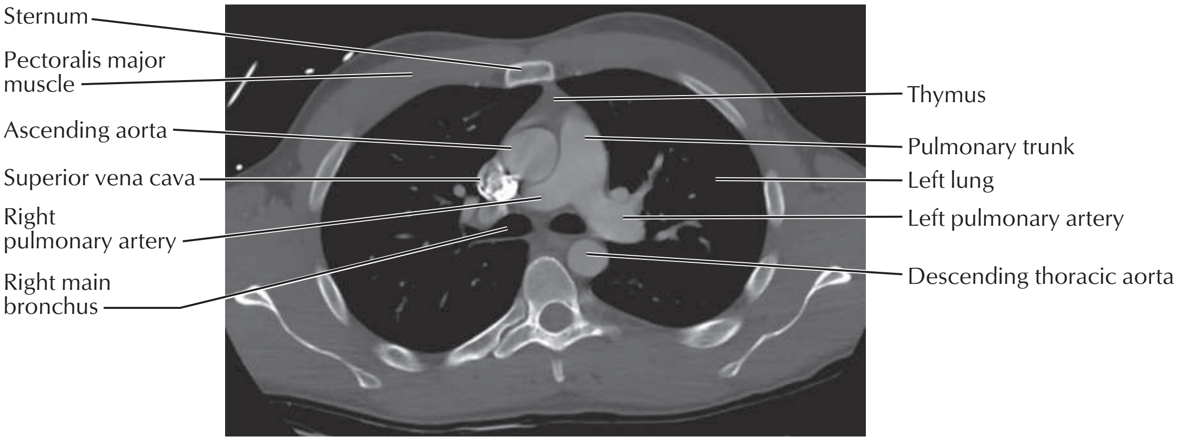

Inferior deep cervical (internal jugular) nodes
Thoracic duct
Paratracheal nodes
Posterior mediastinal nodes
Intercostal nodes
Posterior parietal nodes
Superior and inferior tracheobronchial nodes
Superior phrenic nodes
Left gastric nodes (cardiac nodes of stomach)
Juxtaesophageal and superior phrenic nodes
Celiac nodes

See also Plates 301, 302

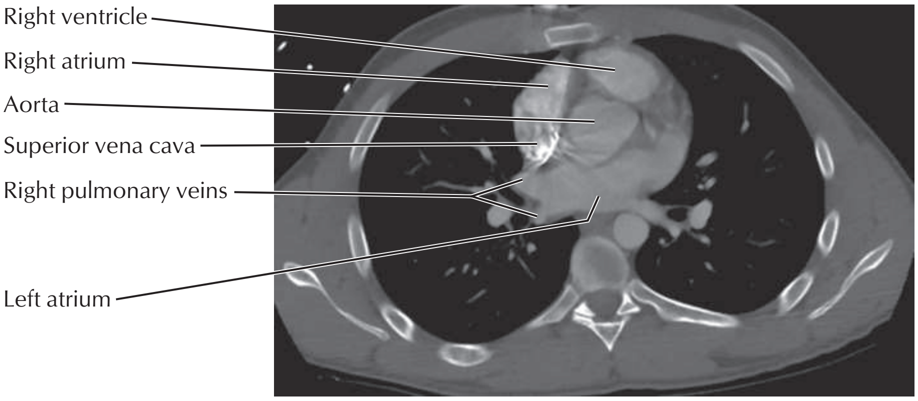

Anterior view
Superior ganglion of vagus nerve
Superior cervical ganglion
Inferior ganglion of vagus nerve
Pharyngeal branch of vagus nerve
Vagus nerve (CN X)
Superior laryngeal nerve
Cervical sympathetic trunk
Middle cervical ganglion
Cervical (sympathetic and vagal) cardiac nerves
Vertebral ganglion
Ansa subclavia
Branch to esophagus and recurrent nerve from stellate ganglion
Cervicothoracic (stellate) ganglion
Left recurrent laryngeal nerve
Thoracic (vagal and sympathetic) cardiac branches
Cardiac plexus
Pulmonary plexuses
Esophageal plexus (anterior portion)
Branches to esophageal plexus from sympathetic trunk, greater thoracic splanchnic nerve, and thoracic aortic plexus
Left greater thoracic splanchnic nerve
Anterior vagal trunk (CN X)
Vagal branch to hepatic plexus via lesser omentum
Anterior nerve of lesser curvature (CN X)
Vagal branch to fundus and body of stomach
Esophagus
Recurrent laryngeal nerves
Right recurrent laryngeal nerve
Ansa subclavia
3rd intercostal nerve
Gray and white rami communicantes
3rd thoracic ganglion
Sympathetic trunk
Right greater thoracic splanchnic nerve
Sympathetic fibers along left inferior phrenic artery
Branch of posterior vagal trunk to celiac plexus
Greater thoracic splanchnic nerves
Sympathetic fibers along esophageal branch of left gastric artery
Celiac plexus and ganglia
Posterior view
Right vagus nerve (CN X)
Esophageal plexus (posterior portion)
Posterior vagal trunk (CN X)
Vagal branch to celiac plexus
Posterior nerve of lesser curvature (CN X)
Vagal branch to fundus and cardiac part of stomach
F. Netter M.D.

Axial CT images of the thorax from superior (A) to inferior (C)

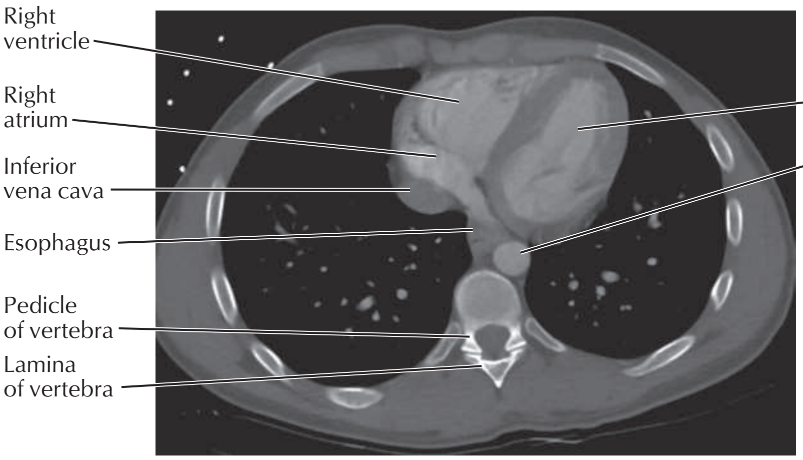
A

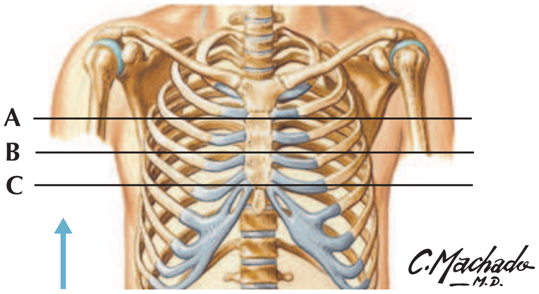

Sternum
Pectoralis major muscle
Ascending aorta
Superior vena cava
Right pulmonary artery
Right main bronchus
Thymus
Pulmonary trunk
Left lung
Left pulmonary artery
Descending thoracic aorta

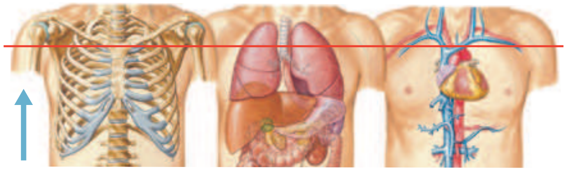
B

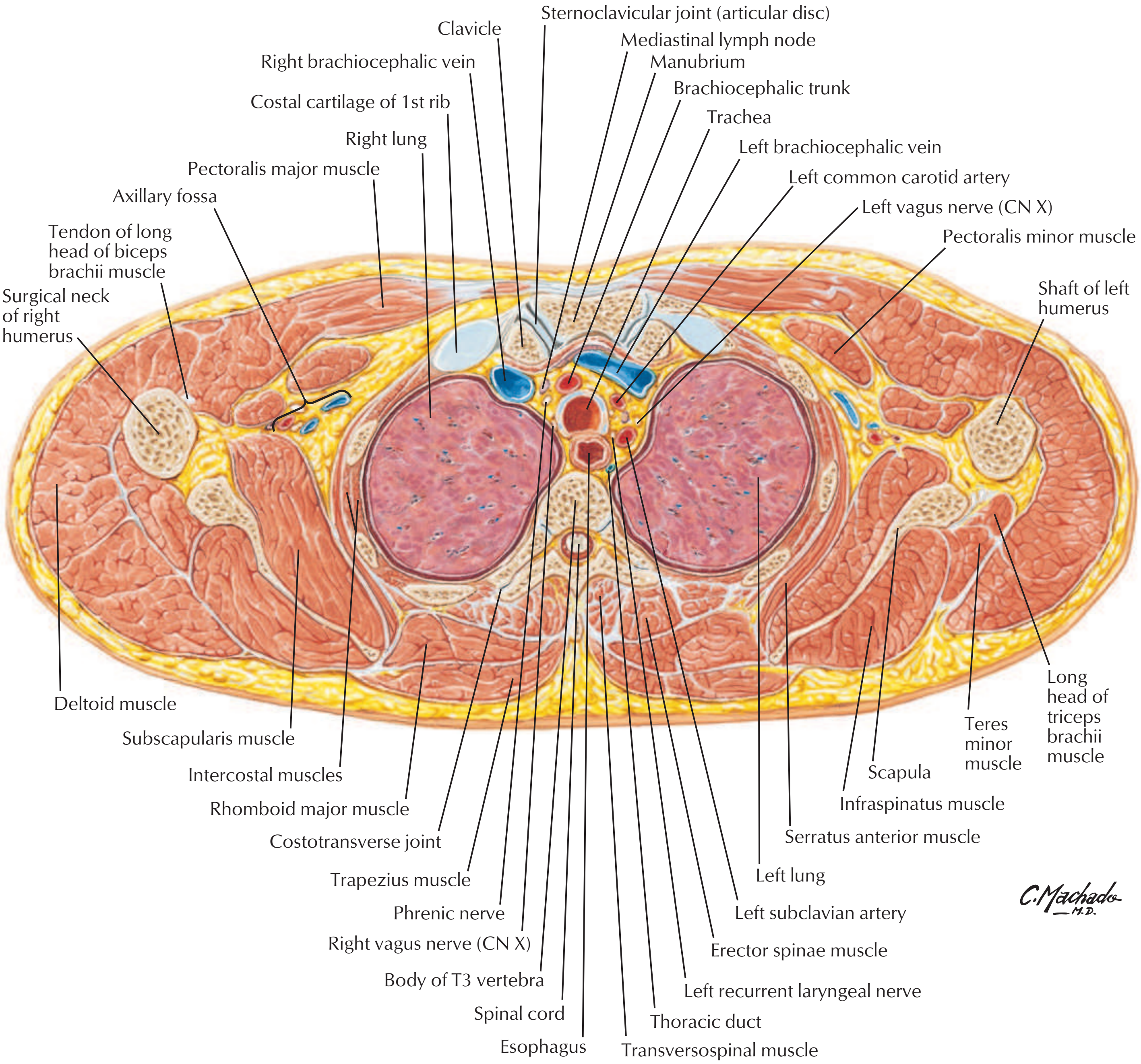

Right ventricle
Right atrium
Aorta
Superior vena cava
Right pulmonary veins
Left atrium

C

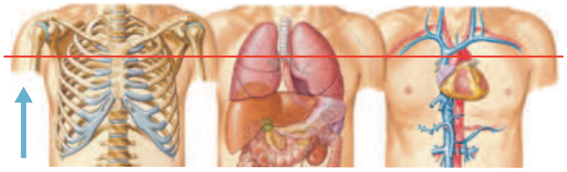

Right ventricle
Right atrium
Inferior vena cava
Esophagus
Pedicle of vertebra
Lamina of vertebra
Left ventricle
Descending thoracic aorta

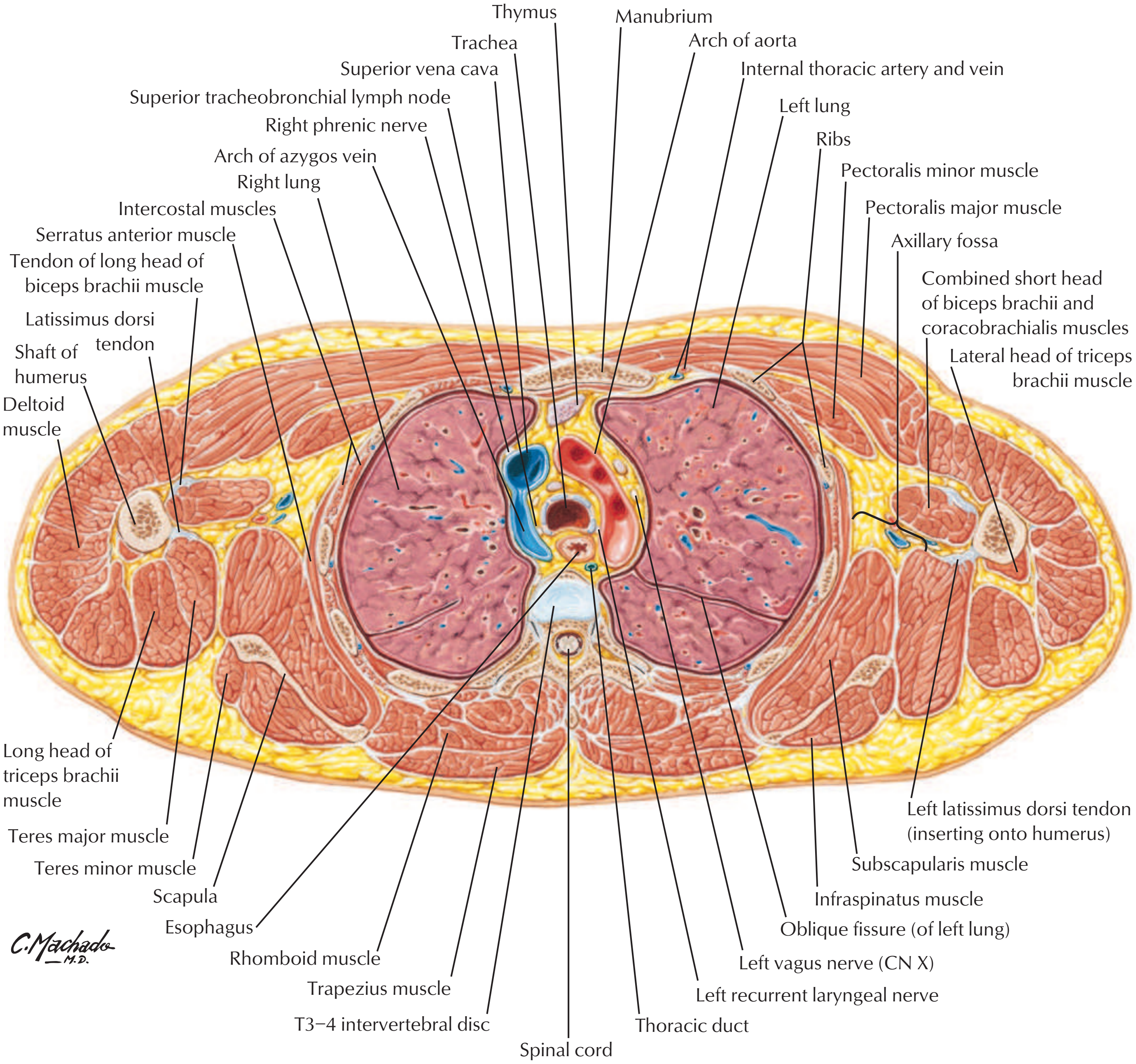

A
B
C
C.Machado M.D.

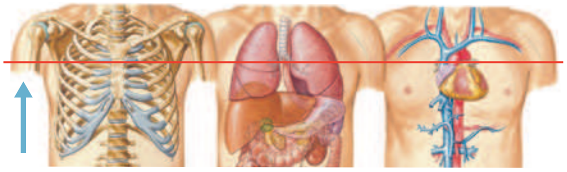


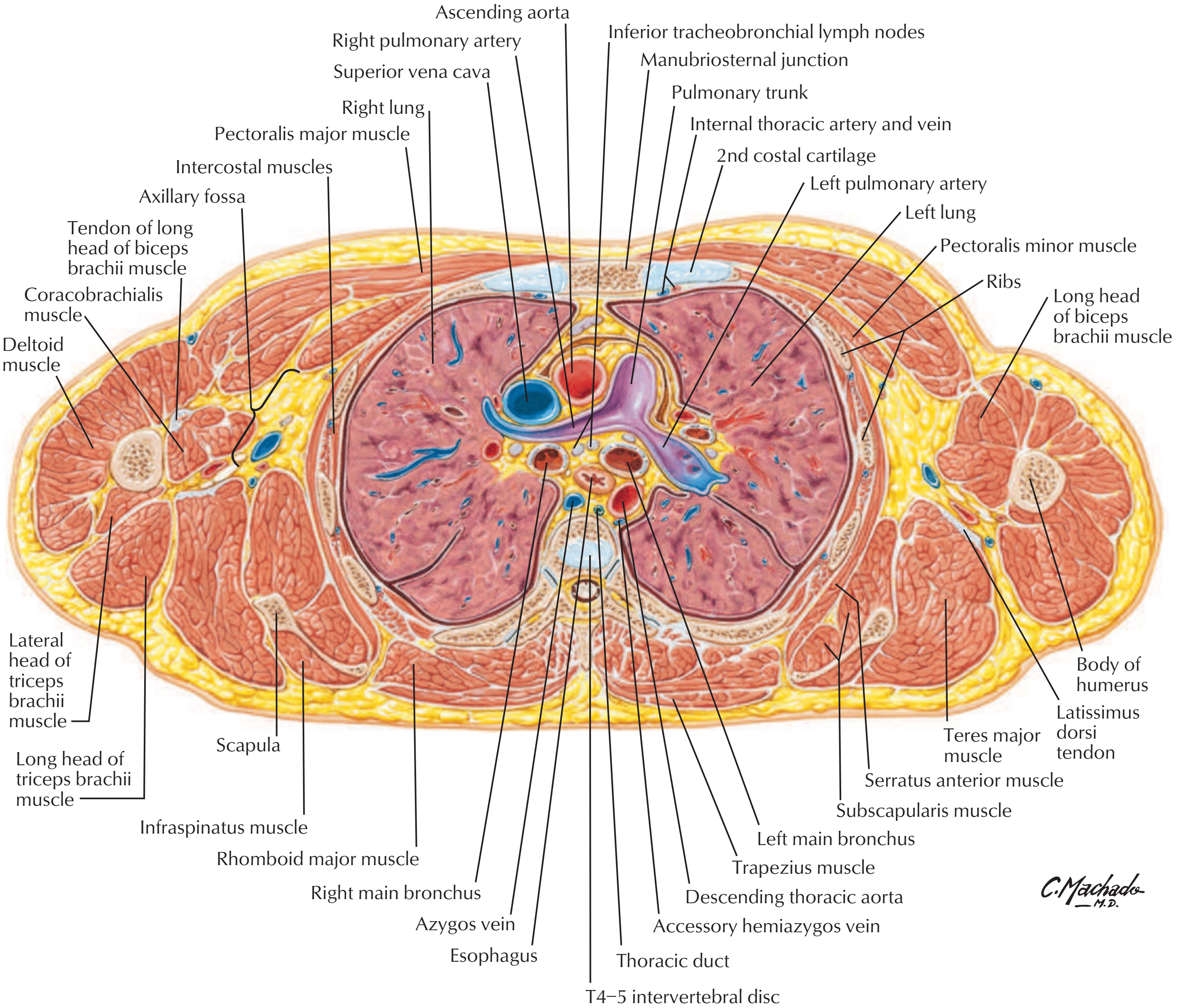

Sternoclavicular joint (articular disc)
Clavicle
Mediastinal lymph node
Right brachiocephalic vein
Manubrium
Brachiocephalic trunk
Costal cartilage of 1st rib
Trachea
Right lung
Left brachiocephalic vein
Pectoralis major muscle
Left common carotid artery
Axillary fossa
Left vagus nerve (CN X)
Tendon of long head of biceps brachii muscle
Pectoralis minor muscle
Surgical neck of right humerus
Shaft of left humerus
Deltoid muscle
Subscapularis muscle
Intercostal muscles
Rhomboid major muscle
Costotransverse joint
Trapezius muscle
Phrenic nerve
Right vagus nerve (CN X)
Body of T3 vertebra
Spinal cord
Esophagus
Long head of triceps brachii muscle
Teres minor muscle
Scapula
Infraspinatus muscle
Serratus anterior muscle
Left lung
Left subclavian artery
Erector spinae muscle
Left recurrent laryngeal nerve
Thoracic duct
Transversospinal muscle
C.Machado M.D.

Cross Section of Thorax at T3-4 Disc Level

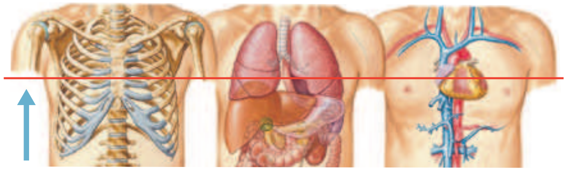


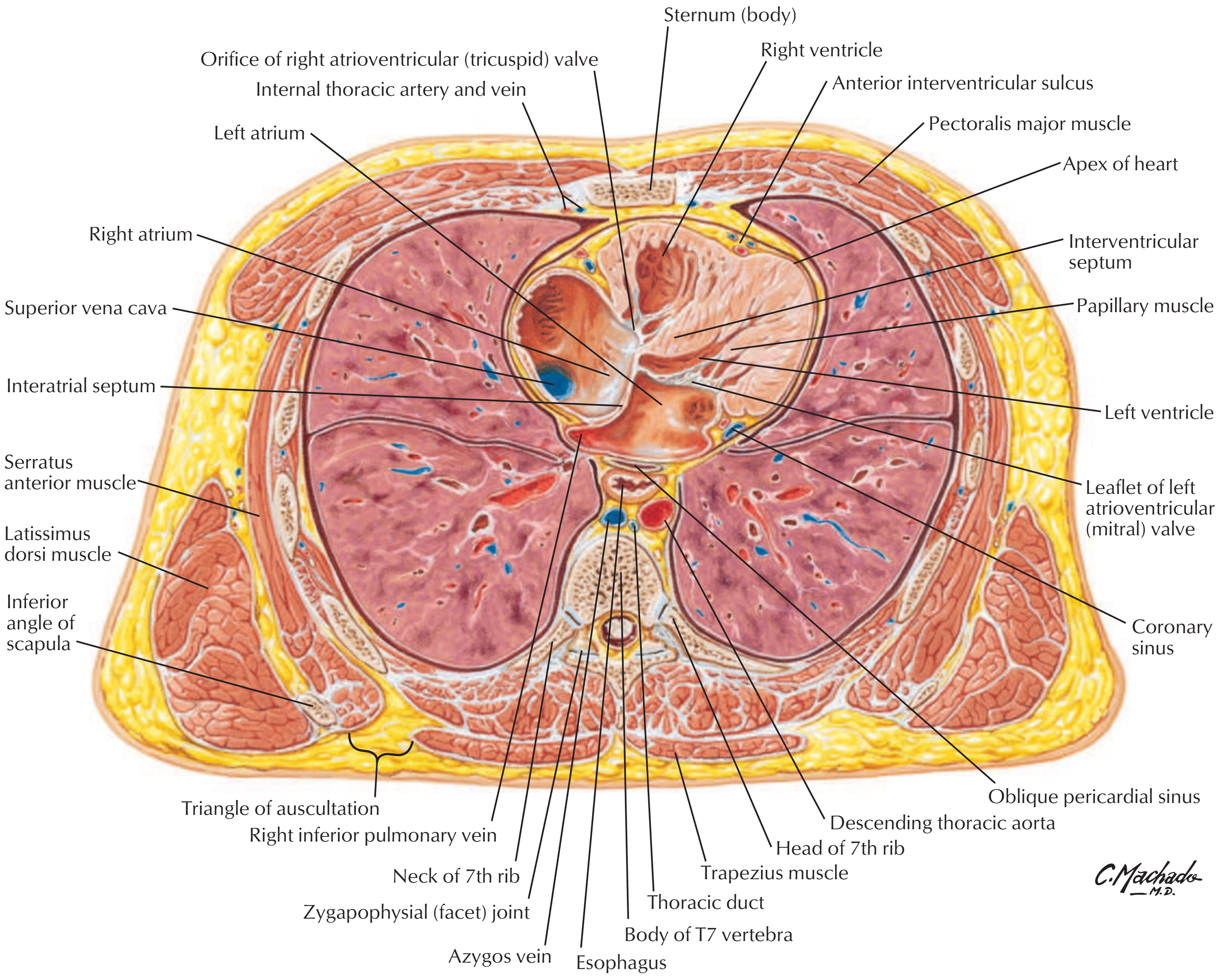

Thymus
Manubrium
Trachea
Arch of aorta
Superior vena cava
Internal thoracic artery and vein
Superior tracheobronchial lymph node
Left lung
Right phrenic nerve
Ribs
Arch of azygos vein
Pectoralis minor muscle
Right lung
Pectoralis major muscle
Intercostal muscles
Axillary fossa
Serratus anterior muscle
Tendon of long head of biceps brachii muscle
Combined short head of biceps brachii and coracobrachialis muscles
Latissimus dorsi tendon
Lateral head of triceps brachii muscle
Shaft of humerus
Deltoid muscle
Long head of triceps brachii muscle
Left latissimus dorsi tendon (inserting onto humerus)
Teres major muscle
Subscapularis muscle
Teres minor muscle
Scapula
Infraspinatus muscle
Esophagus
Oblique fissure (of left lung)
Rhomboid muscle
Left vagus nerve (CN X)
Trapezius muscle
Left recurrent laryngeal nerve
T3–4 intervertebral disc
Thoracic duct
Spinal cord
C.Machado M.D.




Ascending aorta
Right pulmonary artery
Superior vena cava
Right lung
Pectoralis major muscle
Intercostal muscles
Axillary fossa
Tendon of long head of biceps brachii muscle
Coracobrachialis muscle
Deltoid muscle
Inferior tracheobronchial lymph nodes
Manubriosternal junction
Pulmonary trunk
Internal thoracic artery and vein
2nd costal cartilage
Left pulmonary artery
Left lung
Pectoralis minor muscle
Ribs
Long head of biceps brachii muscle
Lateral head of triceps brachii muscle
Long head of triceps brachii muscle
Scapula
Infraspinatus muscle
Rhomboid major muscle
Right main bronchus
Azygos vein
Esophagus
T4–5 intervertebral disc
Thoracic duct
Accessory hemiazygos vein
Descending thoracic aorta
Trapezius muscle
Left main bronchus
Subscapularis muscle
Serratus anterior muscle
Teres major muscle
Latissimus dorsi tendon
Body of humerus
C. Machado M.D.

Cross Section of Thorax at T7 Level




Sternum (body)
Right ventricle
Orifice of right atrioventricular (tricuspid) valve
Internal thoracic artery and vein
Anterior interventricular sulcus
Pectoralis major muscle
Left atrium
Apex of heart
Right atrium
Interventricular septum
Superior vena cava
Papillary muscle
Interatrial septum
Left ventricle
Serratus anterior muscle
Leaflet of left atrioventricular (mitral) valve
Latissimus dorsi muscle
Inferior angle of scapula
Coronary sinus
Oblique pericardial sinus
Triangle of auscultation
Descending thoracic aorta
Right inferior pulmonary vein
Head of 7th rib
Neck of 7th rib
Trapezius muscle
Zygapophysial (facet) joint
Thoracic duct
Body of T7 vertebra
Azygos vein
Esophagus
C. Machado M.D.

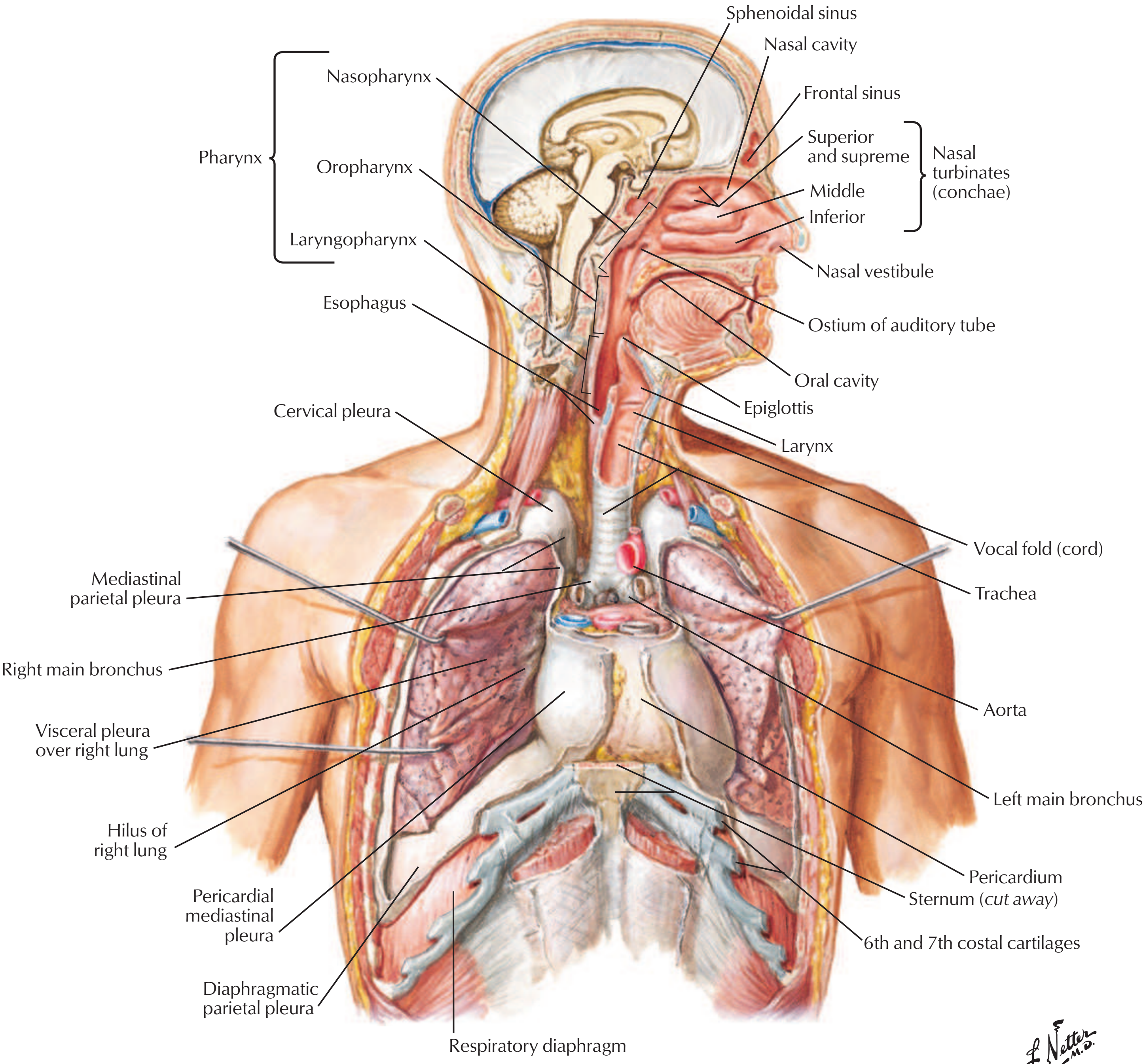
ANATOMICAL STRUCTURES	CLINICAL IMPORTANCE	PLATE NUMBERS
INTEGUMENTARY SYSTEM		
Mammary gland	Breast cancer is most common malignancy in women; movement of breast with pectoral muscles indicates invasion of retromammary space	188
SKELETAL SYSTEM		
Ribs	Rib fractures may breach pleural space and cause pneumothorax; flail chest occurs when multiple rib fractures lead to thoracic cage instability	192
Sternal angle (of Louis)	Surface landmark for counting ribs (2nd pair of ribs articulate here) and intercostal spaces; divides superior from inferior mediastinum	192
Chest wall (ribs and intercostal spaces)	Knowledge of relationships between chest wall and underlying organs is necessary for thoracotomy	194, 202, 204
Left ribs (ribs 9, 10, 11)	If fractured, may cause injury to underlying spleen	202
Superior thoracic aperture	Compression of neurovascular structures traversing superior thoracic aperture may produce thoracic outlet syndrome	198
MUSCULAR SYSTEM		
Intercostal spaces	Important relationship of intercostal neurovascular bundle to ribs when placing chest drainage tube to relieve pneumothorax or hemothorax	195, 221
Respiratory diaphragm	Widening of esophageal hiatus or congenital defect allows for protrusion of stomach into thorax (hiatal hernia)	201, 239
RESPIRATORY SYSTEM		
Lines of pleural reflection	Knowledge of location of lung and pleura with respect to chest wall is necessary for chest tube thoracostomy	202, 203
Pleura of lungs	Air or gas (spontaneous or traumatic) can leak into pleural space between visceral and parietal pleura and compress lung	202, 204
Cervical pleura	Extends into neck superior to 1st rib; it may therefore be punctured during neck procedures, producing pneumothorax	202
Tracheal bifurcation	Right main bronchus is shorter, more vertical, and wider; aspirated objects are therefore often in right lung	208
Apex of lung	Pancoast syndrome (bronchiogenic carcinoma) of apex invades sympathetic trunk, resulting in Horner's syndrome (ipsilateral miosis, ptosis, anhidrosis, facial flushing)	202, 234
NERVOUS SYSTEM		
Long thoracic nerve	May be damaged during chest tube placement or mastectomy, resulting in winged scapula (denervation of serratus anterior muscle)	189, 194
Intercostal nerve	Site of local anesthetic nerve block for procedures such as thoracostomy or to alleviate pain caused by shingles	196, 197
Posterior root (spinal) ganglion	Can house dormant varicella zoster virus, which, when activated, can result in herpes zoster (shingles)	197
Phrenic nerve and respiratory diaphragm	Ipsilateral injury to phrenic nerve may cause ipsilateral paralysis of hemidiaphragm Diaphragmatic irritation may manifest as shoulder pain because of referral to C3-5 spinal levels	199, 201 199, 216
Recurrent laryngeal branch of vagus nerve (CN X)	Pathologic findings in aorticopulmonary window may compress this nerve and produce hoarseness of voice	235, 236

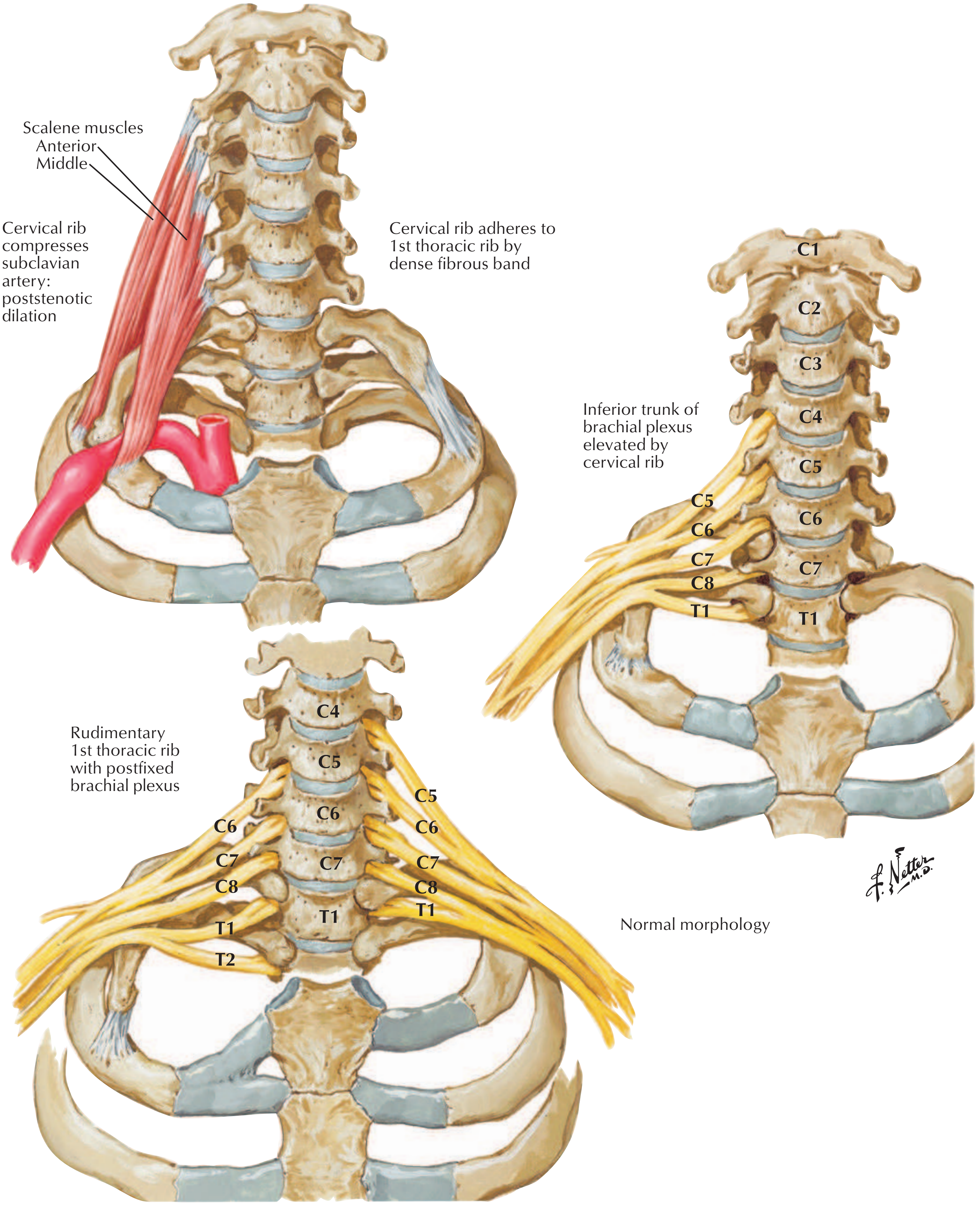
ANATOMICAL STRUCTURES	CLINICAL IMPORTANCE	PLATE NUMBERS
NERVOUS SYSTEM—Continued		
Visceral pain afferents from heart	Pain of myocardial ischemia referred to upper thoracic dermatomes; may be perceived as somatic pain in chest and medial upper limb	231
CARDIOVASCULAR SYSTEM		
Internal thoracic artery	Commonly used for coronary artery bypass grafts	196, 197
Pulmonary arteries	Thromboemboli may obstruct pulmonary vasculature, leading to infarction	205, 210
Pericardium	Pericardial effusion (accumulation of fluid or blood) may compromise heart function (cardiac tamponade)	215, 219
Coronary arteries	Atherosclerotic blockage may cause myocardial ischemia and/or infarct; anterior interventricular (left anterior descending) artery most commonly diseased	222
Interventricular septum of heart	Ventricular septal defect is most common congenital cardiac defect; most often involves membranous part of septum	225, 228
Heart valves	Congenital variations of valve anatomy or valvular disease (e.g., rheumatic heart disease) can cause valvular stenosis	226
Sinuatrial node	Aging, previous heart surgery, and some medications can cause cardiac arrhythmias	229
Ligamentum arteriosum	Abnormal closure of ductus arteriosus can produce aortic coarctation; lack of closure produces patent ductus arteriosus; if not closed, may cause exertional dyspnea, pulmonary vascular disease, or heart failure	233
Thoracic aorta	Congenital coarctation of aorta can compromise systemic blood flow; collateral vascular connections can alleviate this condition	240
Azygos venous system	Drains posterior thorax and provides important collateral channel between inferior vena cava and superior vena cava	241
LYMPHATIC SYSTEM		
Mammary gland lymphatics	Metastatic spread of cancer cells to axilla and chest via lymphatics draining breast	191
Axillary lymph nodes	Primary nodes that receive lymphatic drainage from upper limb, thoracic wall, and breast; commonly enlarged in patients with breast cancer	190, 191

*Selections were based largely on clinical data as well as commonly covered clinical correlations in gross anatomy courses.

MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Respiratory diaphragm	Posterior abdominal wall	Xiphoid process, lower six costal cartilages, L1–L3 vertebrae	Converge into central tendon	Phrenic nerve	Pericardiacophrenic, musculophrenic, superior and inferior phrenic arteries	Draws central tendon down and forward during inspiration
External intercostal	Thoracic wall	Lower border of ribs	Upper border of rib below rib of origin	Intercostal nerves	Posterior intercostal arteries, collateral branches of posterior intercostal arteries, costocervical trunk, anterior intercostal branches of internal thoracic artery, musculophrenic artery	Supports intercostal spaces in inspiration and expiration, elevates ribs in inspiration
Innermost intercostal	Thoracic wall	Lower border of ribs	Upper border of rib below rib of origin	Intercostal nerves	Muscular branches of anterior intercostal arteries, muscular branches of posterior intercostal arteries, intercostal branches of internal thoracic and musculophrenic arteries, costocervical trunk branches	Elevates ribs
Internal intercostal	Thoracic wall	Lower border of ribs	Costal cartilage and edge of costal groove of rib above rib of origin	Intercostal nerves	Muscular branches of anterior intercostal arteries, muscular branches of posterior intercostal arteries, intercostal branches of internal thoracic and musculophrenic arteries, costocervical trunk branches	Prevents pushing out or drawing in of intercostal spaces in inspiration and expiration, lowers ribs in forced expiration
Levator costarum	Thoracic wall	Transverse processes of C7 and T1–T11	Subjacent ribs between tubercle and angle	Posterior ramus of lower thoracic nerves	Posterior intercostal arteries	Elevates ribs
Pectoralis major	Pectoral/ axillary regions	Sternal half of clavicle, sternum to 7th rib, cartilages of true ribs, aponeurosis of external abdominal oblique muscle	Lateral lip of intertubercular sulcus of humerus	Medial and lateral pectoral nerves	Pectoral branch of thoracoacromial artery, perforating branches of internal thoracic artery	Flexes, adducts, and medially rotates arm
Pectoralis minor	Pectoral/ axillary regions	Outer surface of upper margin of ribs 3–5	Coracoid process of scapula	Medial pectoral nerve	Pectoral branch of thoracoacromial artery, and superior and lateral thoracic arteries	Lowers lateral angle of scapula and protracts scapula
Serratus anterior	Shoulder	Lateral surfaces of upper 8–9 ribs	Costal surface of medial border of scapula	Long thoracic nerve	Lateral thoracic artery	Protracts and rotates scapula and holds it against thoracic wall
Serratus posterior inferior	Intermediate back	Spinous processes of T11–L2	Inferior aspect of ribs 9–12	Anterior rami of lower thoracic nerves	Posterior intercostal arteries	Depresses ribs
Serratus posterior superior	Intermediate back	Nuchal ligament, spinous processes of C7–T3	Superior aspect of ribs 2–5	Anterior rami of upper thoracic nerves	Posterior intercostal arteries	Elevates ribs
Subcostal	Thoracic wall	Internal surface of lower ribs near their angles	Superior borders of 2nd or 3rd rib below	Intercostal nerves 2nd–5th	Posterior intercostal artery, musculophrenic artery	Depresses ribs
Transversus thoracis	Thoracic wall	Internal surfaces of costal cartilages 2–6	Posterior surface of lower sternum	Intercostal nerves	Anterior intercostal arteries, internal thoracic artery	Depresses ribs and costal cartilages

Variations in spinal nerve contributions to the innervation of muscles, their arterial supply, their attachments, and their actions are common themes in human anatomy. Therefore, expect differences between texts and realize that anatomical variation is normal.


Sphenoidal sinus
Nasal cavity
Frontal sinus
Superior and supreme
Middle
Inferior
Nasal turbinates (conchae)
Nasal vestibule
Ostium of auditory tube
Oral cavity
Epiglottis
Larynx
Vocal fold (cord)
Trachea
Aorta
Left main bronchus
Pericardium
Sternum (*cut away*)
6th and 7th costal cartilages
Pharynx
Nasopharynx
Oropharynx
Laryngopharynx
Esophagus
Cervical pleura
Mediastinal parietal pleura
Right main bronchus
Visceral pleura over right lung
Hilus of right lung
Pericardial mediastinal pleura
Diaphragmatic parietal pleura
Respiratory diaphragm
F. Netter M.D.



Scalene muscles
Anterior
Middle

Cervical rib compresses subclavian artery: poststenotic dilation

Cervical rib adheres to 1st thoracic rib by dense fibrous band

Inferior trunk of brachial plexus elevated by cervical rib

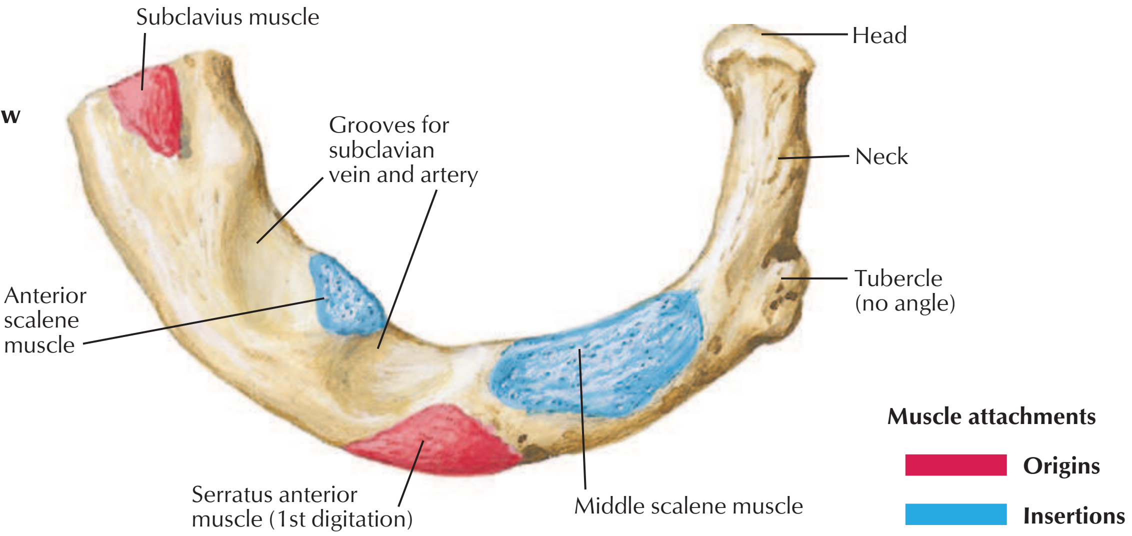
C1
C2
C3
C4
C5
C6
C7
T1
C5
C6
C7
C8
T1

Normal morphology

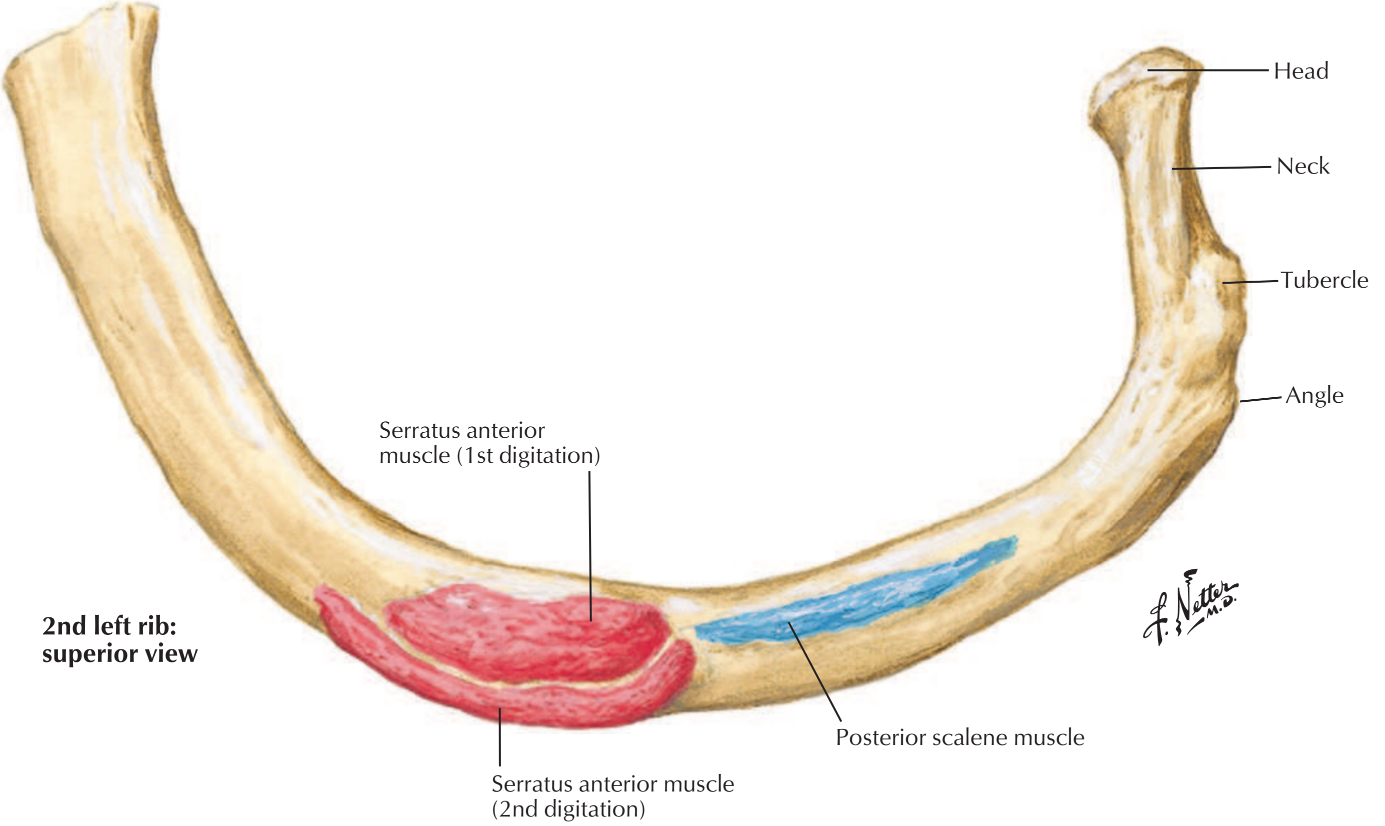
Rudimentary 1st thoracic rib with postfixed brachial plexus

C4
C5
C6
C7
T1
C6
C7
C8
T1
T2
C5
C6
C7
C8
T1

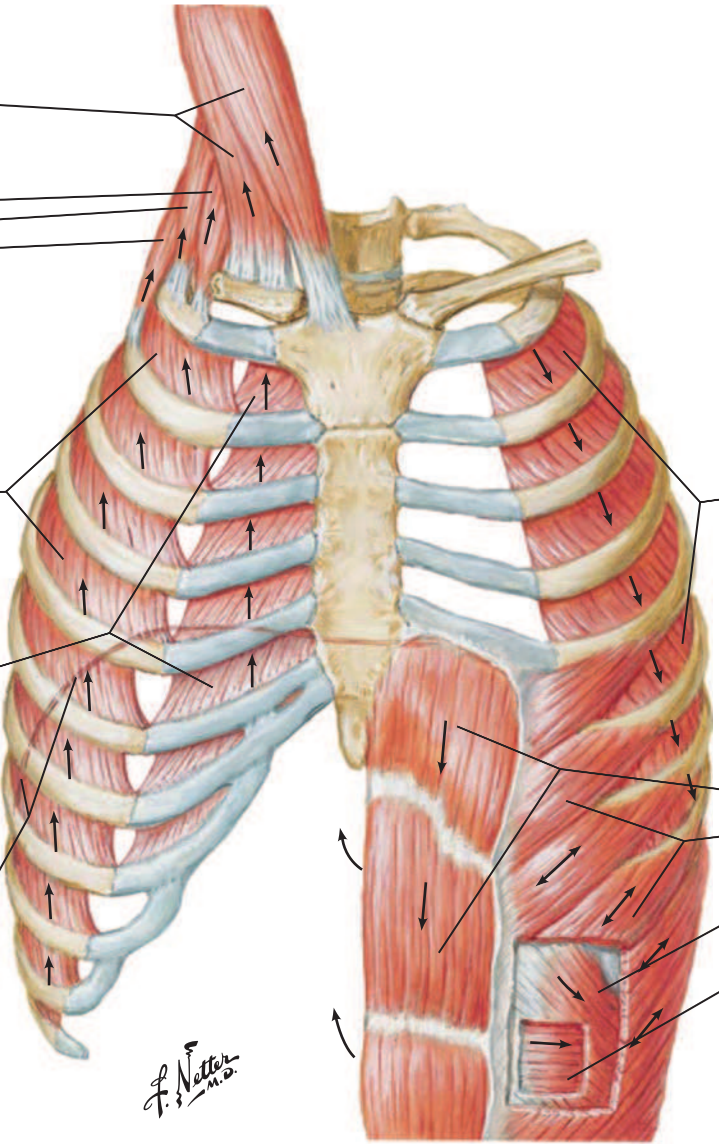
1st left rib: superior view


Subclavius muscle
Head
Grooves for subclavian vein and artery
Neck
Tubercle (no angle)
Anterior scalene muscle
Muscle attachments
🟥 Origins
🟦 Insertions
Serratus anterior muscle (1st digitation)
Middle scalene muscle

2nd left rib: superior view


Head
Neck
Tubercle
Angle
Serratus anterior muscle (1st digitation)
Posterior scalene muscle
Serratus anterior muscle (2nd digitation)
F. Netter M.D.

Muscles of Respiration



Muscles of inspiration

Accessory

Sternocleidomastoid (elevates sternum)

Scalene muscles
- Anterior
- Middle
- Posterior

(elevate and fix upper ribs)

Principal

External intercostals, most superficial (elevate ribs, thus increasing width of thoracic cavity and aiding deep inspiration)

Interchondral parts of internal intercostals are deep to external intercostals (also elevate ribs and aid external intercostals with deep inspiration)

Respiratory diaphragm (domes descend, thus increasing vertical dimension of thoracic cavity; also elevates lower ribs)

Muscles of expiration

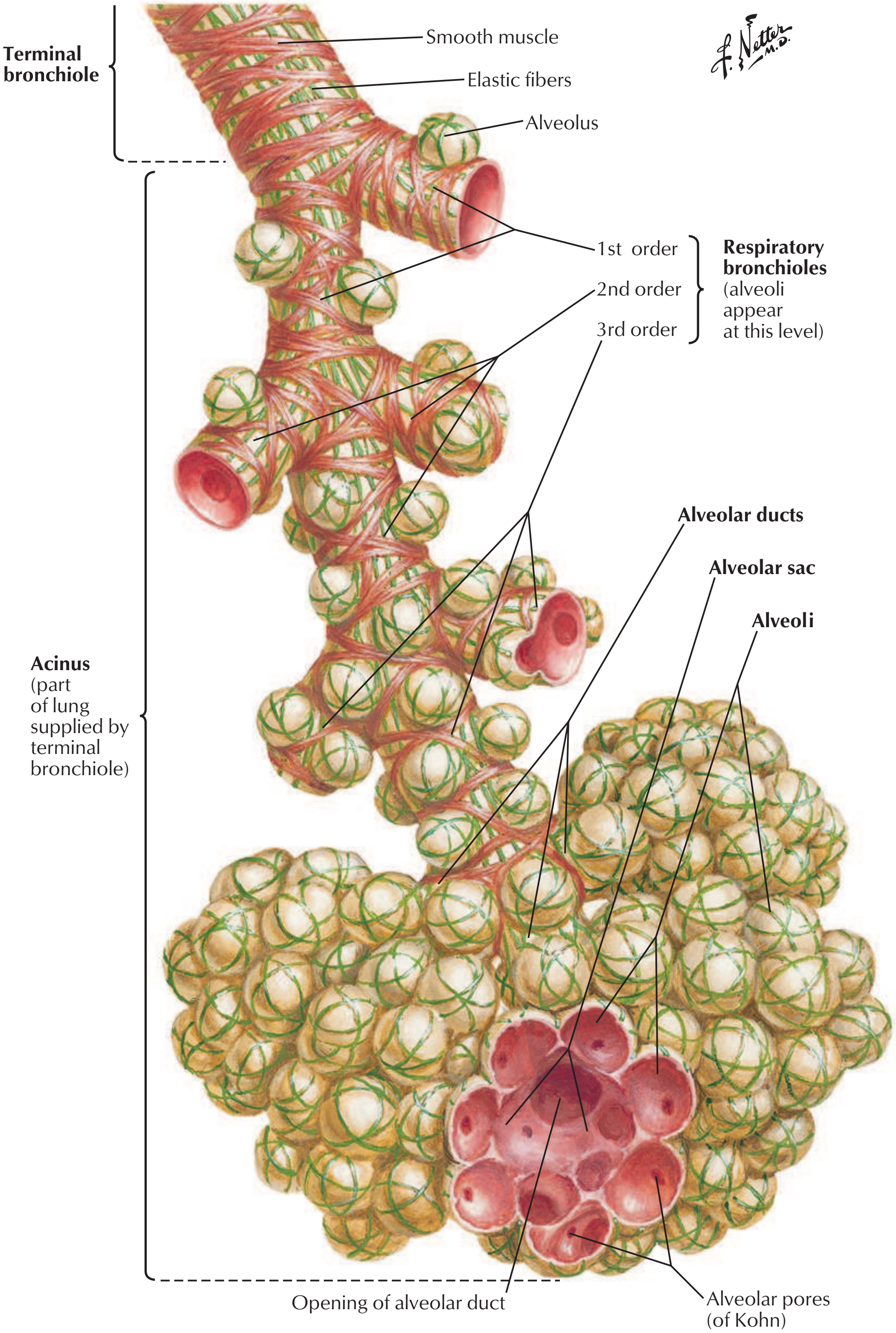
Quiet breathing

Expiration results from passive recoil of lungs and rib cage

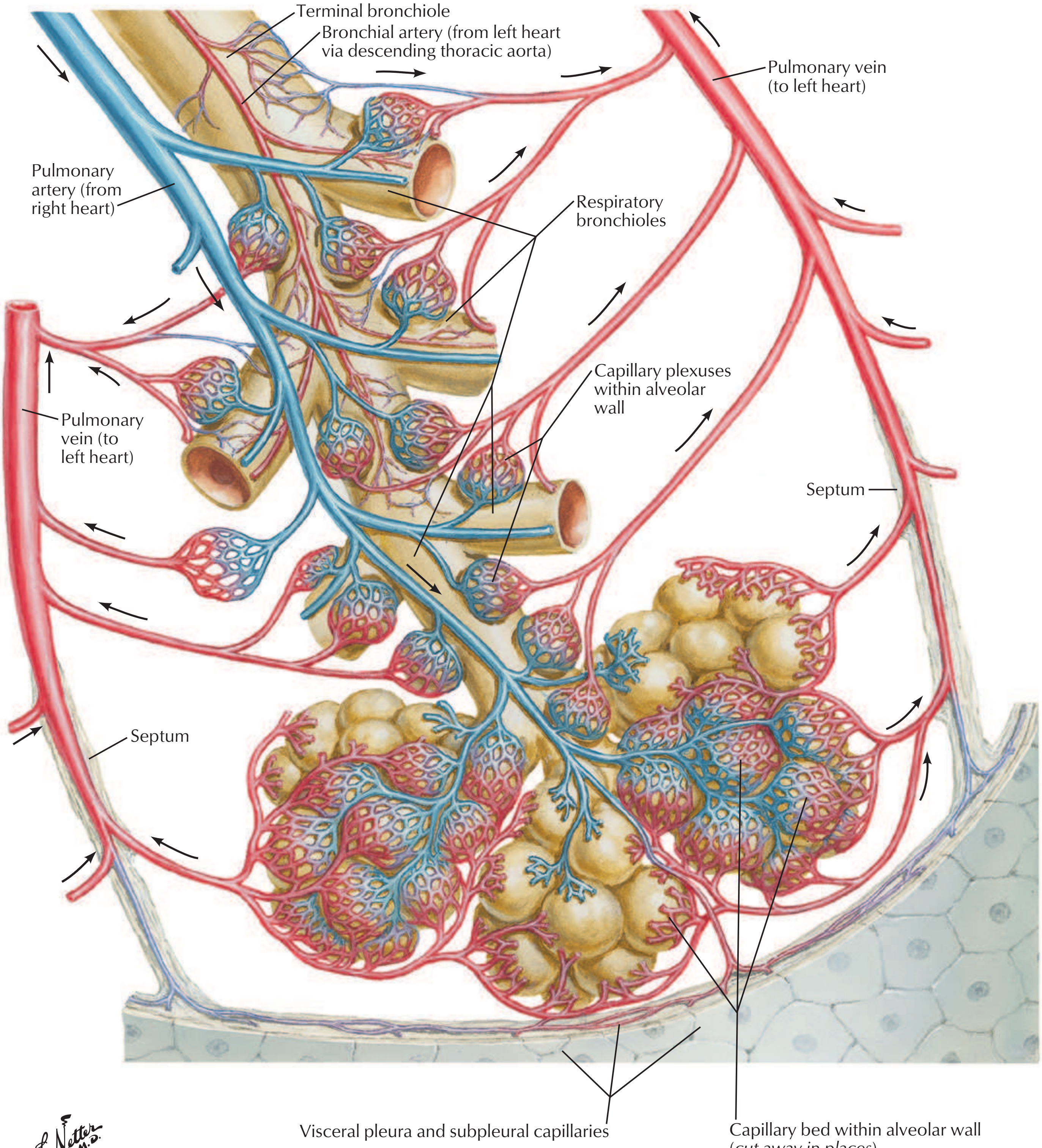
Active breathing

Internal intercostal muscles, except interchondral part (aid forced expiration)

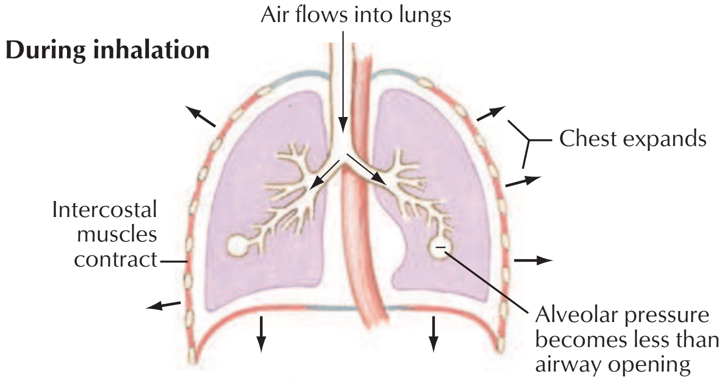
Abdominals (depress lower ribs, compress abdominal contents, thus pushing up respiratory diaphragm, aiding forced expiration)
- Rectus abdominis
- External abdominal oblique muscle
- Internal abdominal oblique muscle
- Transversus abdominis muscle

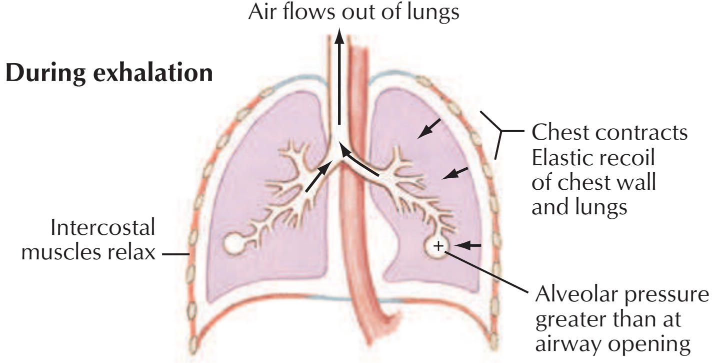

Terminal bronchiole
Smooth muscle
Elastic fibers
Alveolus
1st order
2nd order
3rd order
Respiratory bronchioles (alveoli appear at this level)
Alveolar ducts
Alveolar sac
Alveoli
Acinus (part of lung supplied by terminal bronchiole)
Opening of alveolar duct
Alveolar pores (of Kohn)
F. Netter M.D.

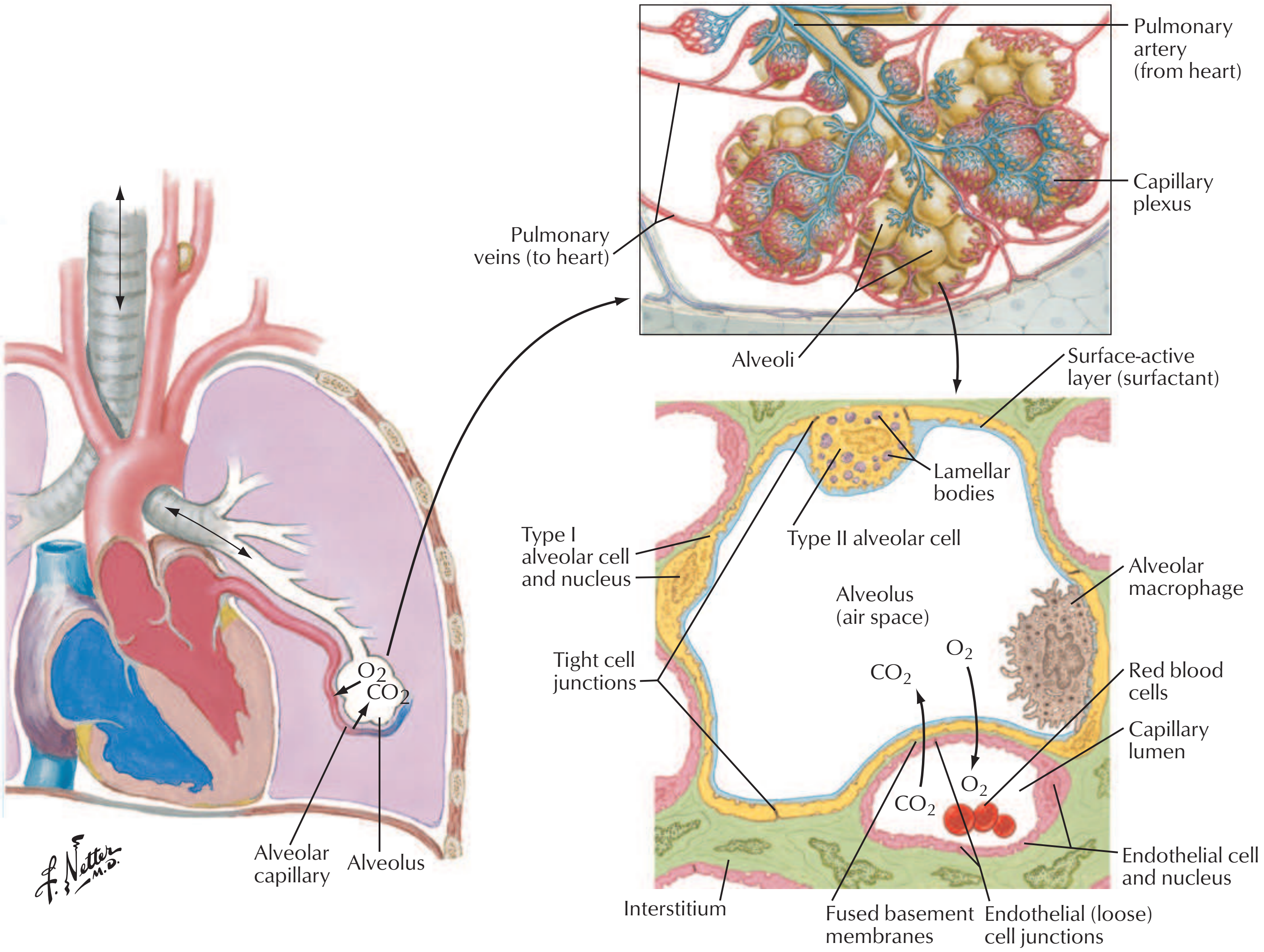
Structure of intrapulmonary airways


Terminal bronchiole
Bronchial artery (from left heart via descending thoracic aorta)
Pulmonary vein (to left heart)
Pulmonary artery (from right heart)
Respiratory bronchioles
Pulmonary vein (to left heart)
Capillary plexuses within alveolar wall
Septum
Septum
Visceral pleura and subpleural capillaries
Capillary bed within alveolar wall (*cut away in places*)

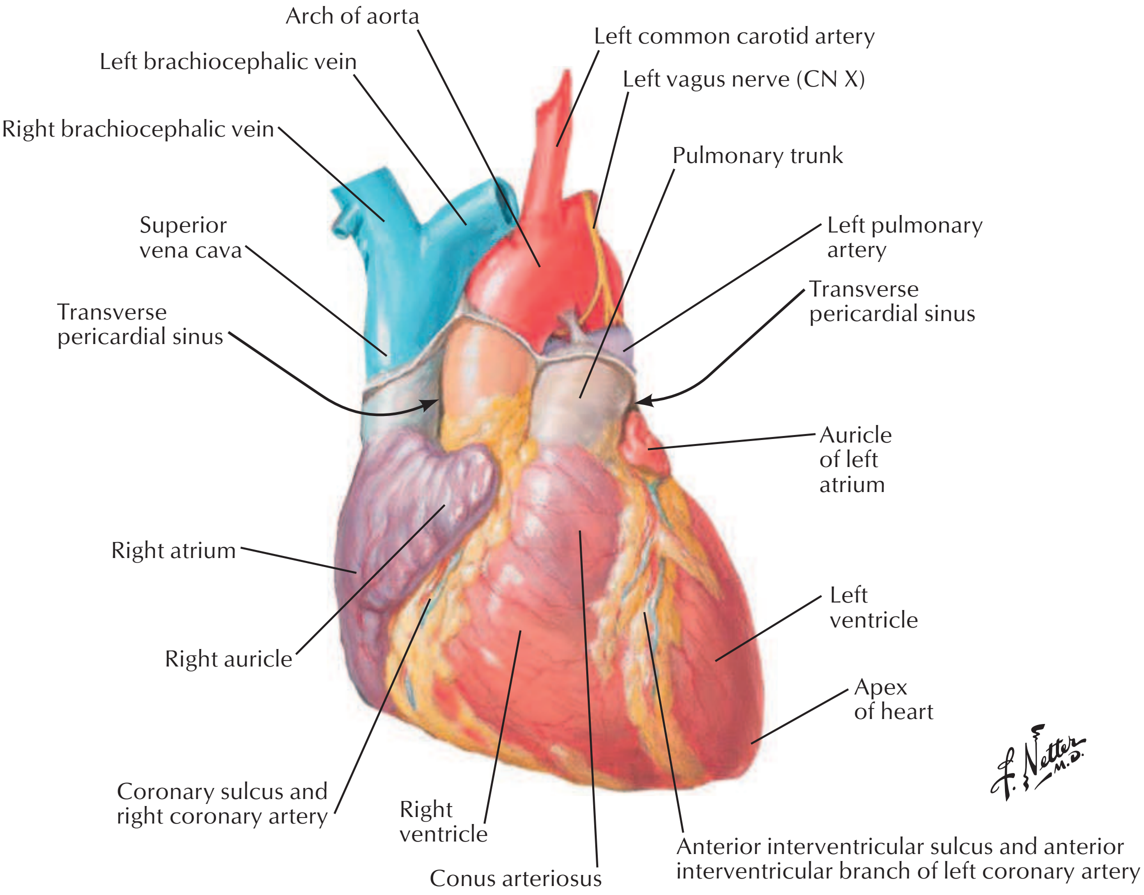
Pulmonary arteries and their branches distribute segmentally with the bronchi. Pulmonary veins and their tributaries drain intersegmentally.


During inhalation
Air flows into lungs
Chest expands
Intercostal muscles contract
Alveolar pressure becomes less than airway opening
−

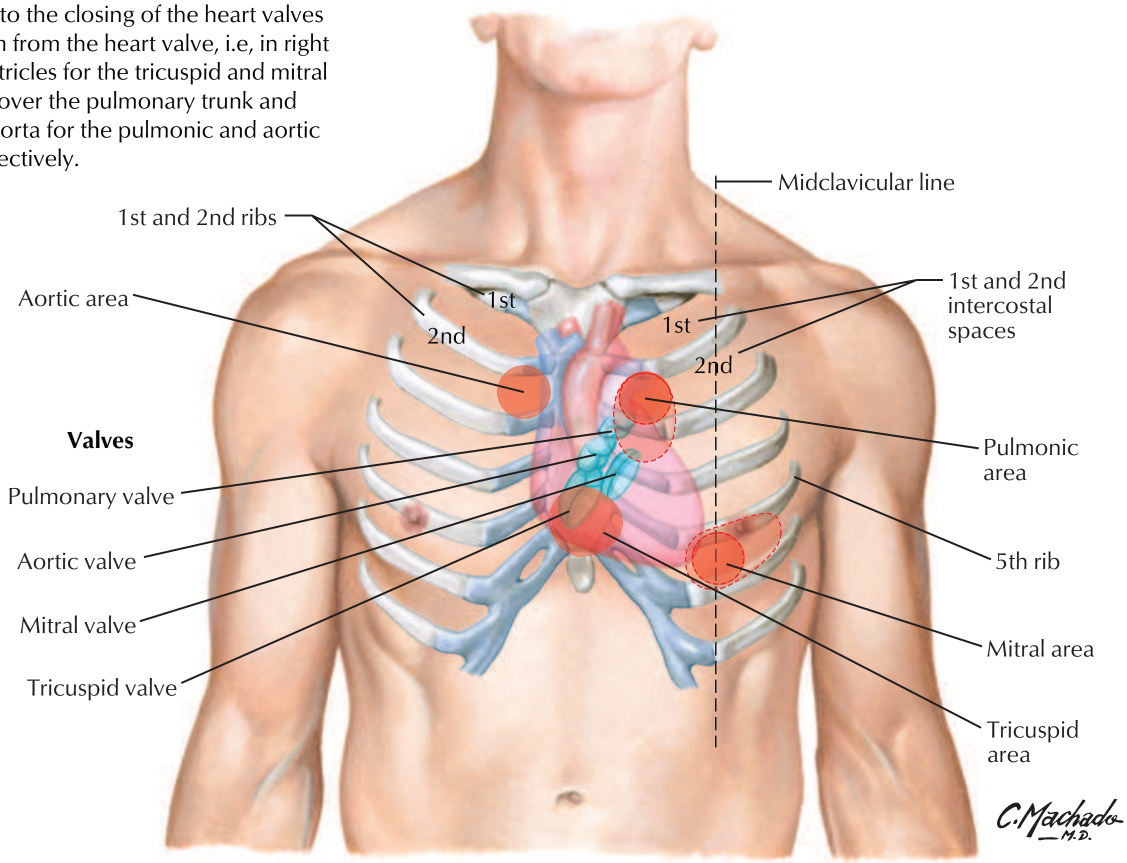

During exhalation
Air flows out of lungs
Chest contracts
Elastic recoil of chest wall and lungs
Intercostal muscles relax
Alveolar pressure greater than at airway opening
+


Pulmonary artery (from heart)
Capillary plexus
Pulmonary veins (to heart)
Alveoli
Surface-active layer (surfactant)
Lamellar bodies
Type II alveolar cell
Type I alveolar cell and nucleus
Alveolar macrophage
Alveolus (air space)
Tight cell junctions
O_2
CO_2
Red blood cells
Capillary lumen
Endothelial cell and nucleus
Interstitium
Fused basement membranes
Endothelial (loose) cell junctions
Alveolar capillary
Alveolus

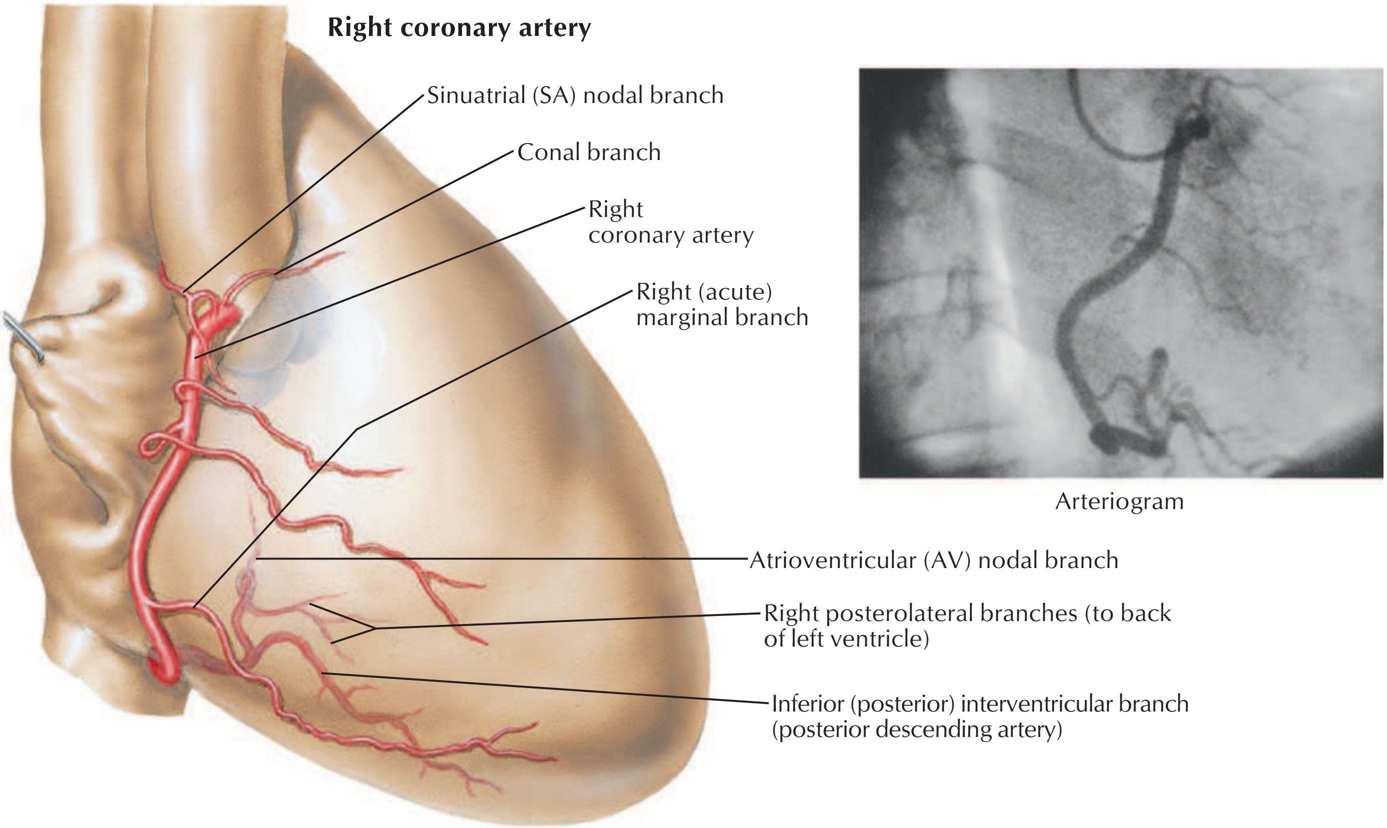
Anterior Aspect of Heart


Arch of aorta
Left brachiocephalic vein
Right brachiocephalic vein
Superior vena cava
Transverse pericardial sinus
Left common carotid artery
Left vagus nerve (CN X)
Pulmonary trunk
Left pulmonary artery
Transverse pericardial sinus
Auricle of left atrium
Right atrium
Right auricle
Left ventricle
Apex of heart
Coronary sulcus and right coronary artery
Right ventricle
Conus arteriosus
Anterior interventricular sulcus and anterior interventricular branch of left coronary artery

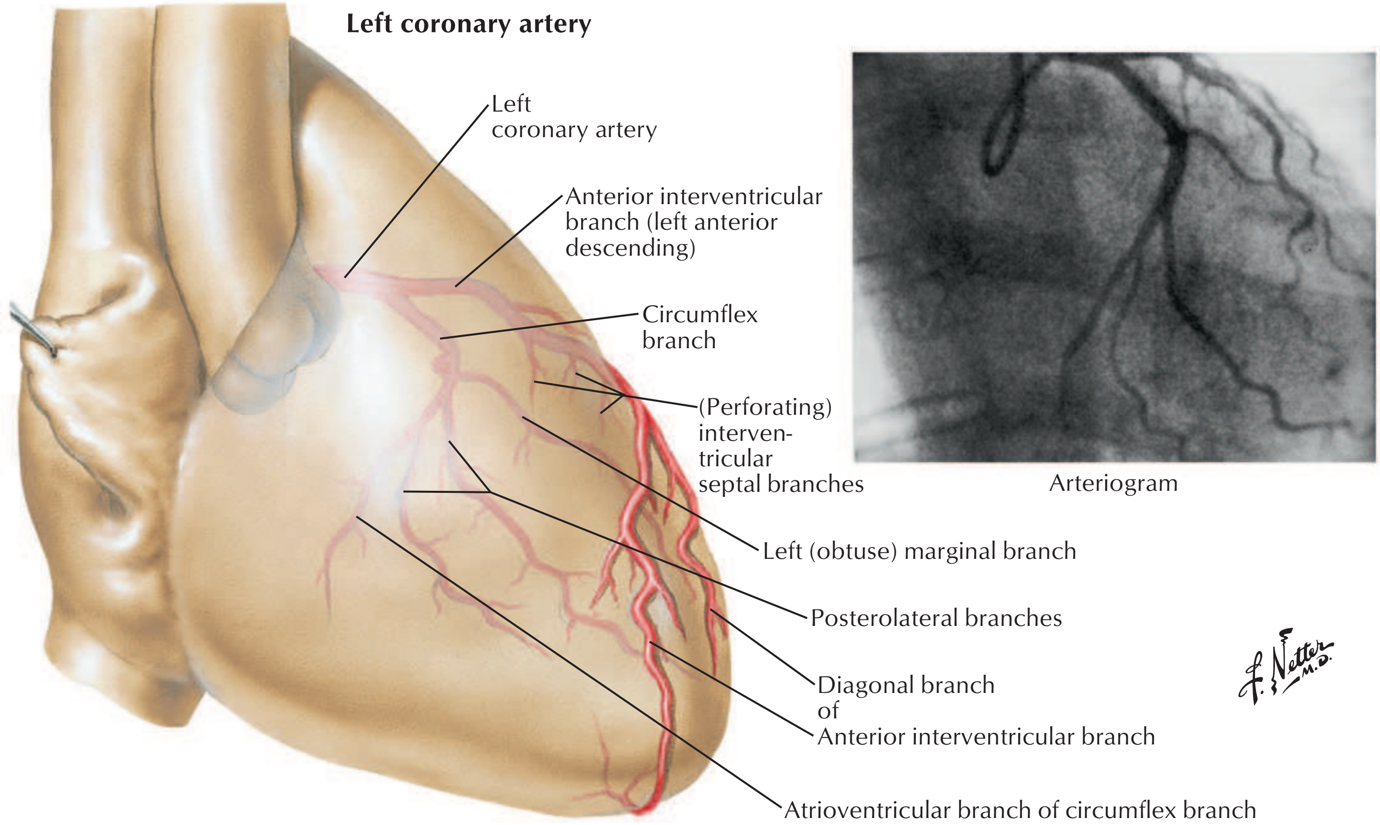
Precordial areas of auscultation:
One listens to the closing of the heart valves downstream from the heart valve, i.e, in right and left ventricles for the tricuspid and mitral valves, and over the pulmonary trunk and ascending aorta for the pulmonic and aortic valves, respectively.


Midclavicular line
1st and 2nd ribs
1st
2nd
Aortic area
1st
2nd
1st and 2nd intercostal spaces
Valves
Pulmonary valve
Aortic valve
Mitral valve
Tricuspid valve
Pulmonic area
5th rib
Mitral area
Tricuspid area
C.Machado M.D.

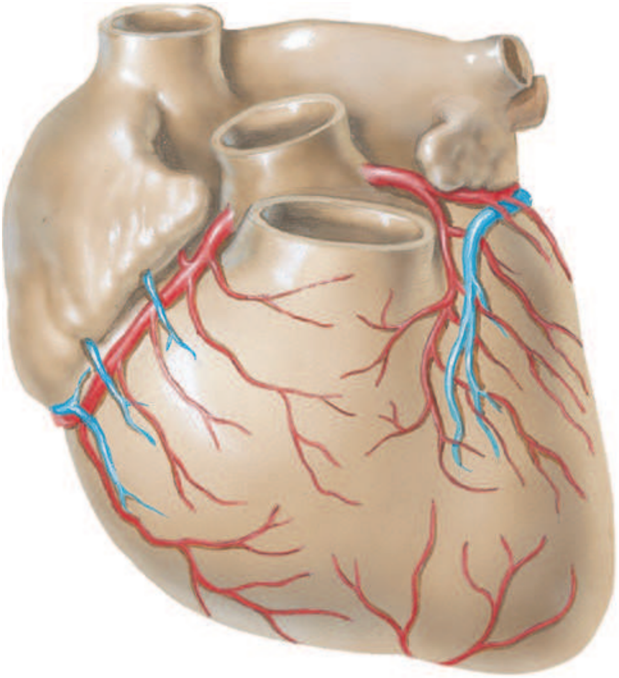
Right coronary artery


Sinuatrial (SA) nodal branch
Conal branch
Right coronary artery
Right (acute) marginal branch
Arteriogram
Atrioventricular (AV) nodal branch
Right posterolateral branches (to back of left ventricle)
Inferior (posterior) interventricular branch (posterior descending artery)

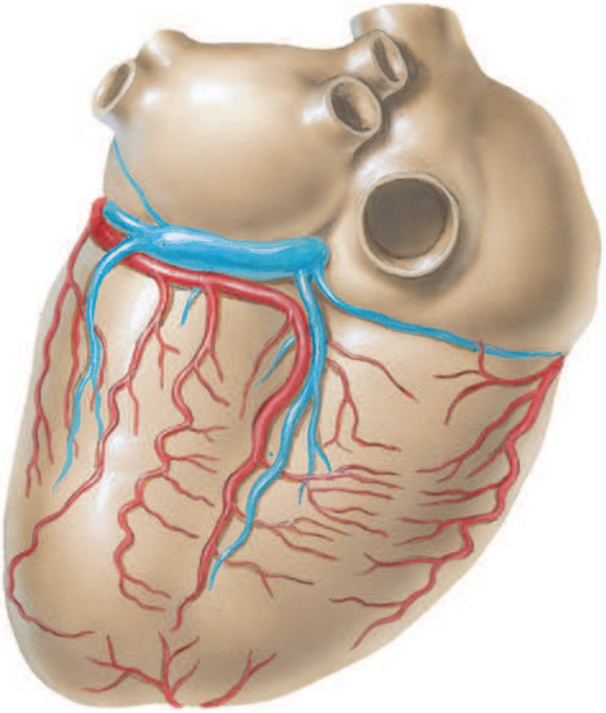
Left coronary artery


Left coronary artery
Anterior interventricular branch (left anterior descending)
Circumflex branch
(Perforating) interventricular septal branches
Arteriogram
Left (obtuse) marginal branch
Posterolateral branches
Diagonal branch of Anterior interventricular branch
Atrioventricular branch of circumflex branch

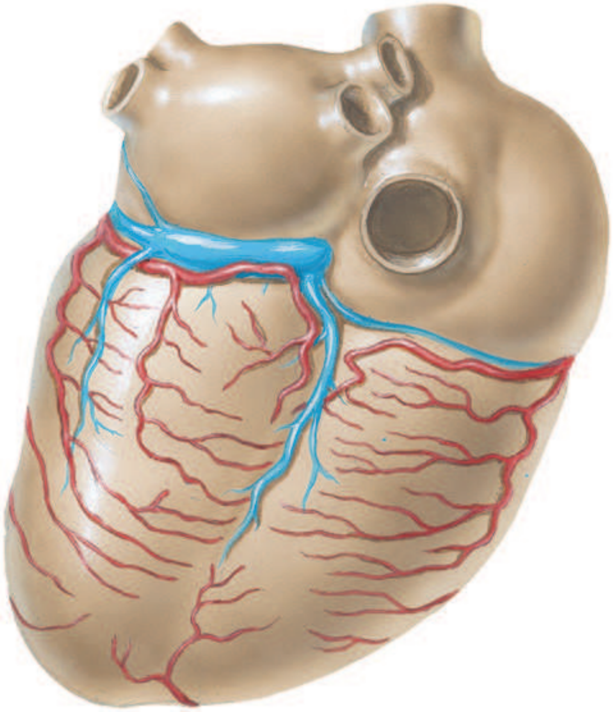
Coronary Arteries and Cardiac Veins: Variations



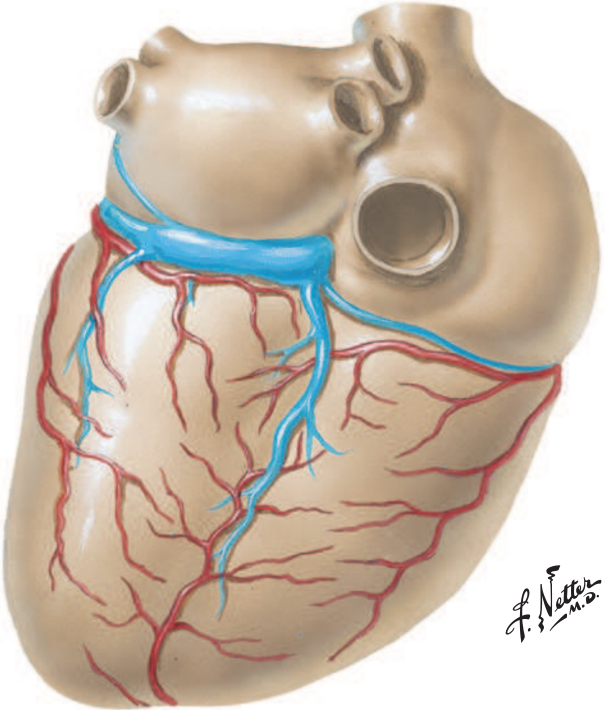
Anterior interventricular (left anterior descending) branch of left coronary artery is very short. Apical part of anterior (sternocostal) surface is supplied by branches from inferior interventricular (posterior descending) branch of right coronary artery curving around apex.



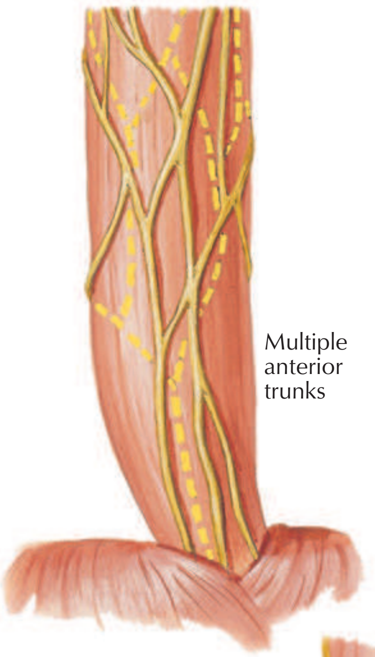
Inferior interventricular (posterior descending) branch is derived from circumflex branch of left coronary artery instead of from right coronary artery.



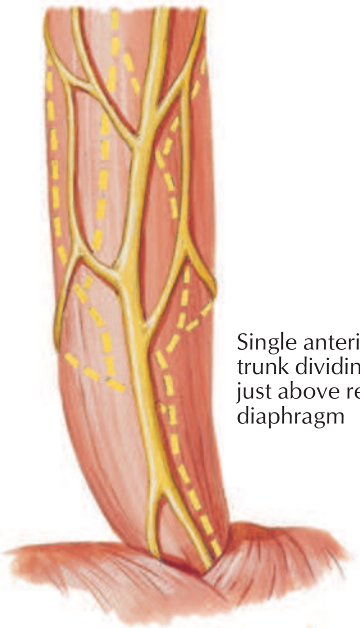
Inferior interventricular (posterior descending) branch is absent. Area is supplied chiefly by small branches from circumflex branch of left coronary artery and from right coronary artery.



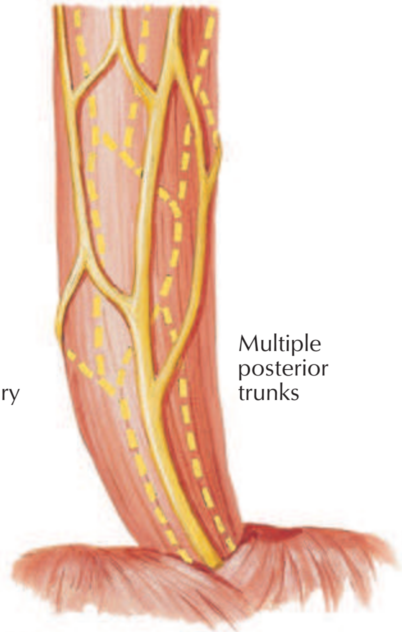
Inferior interventricular (posterior descending) branch is absent. Area is supplied chiefly by elongated anterior interventricular (left anterior descending) branch curving around apex.



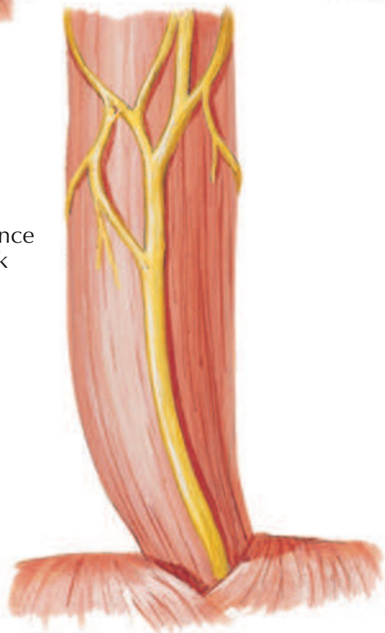
Multiple anterior trunks



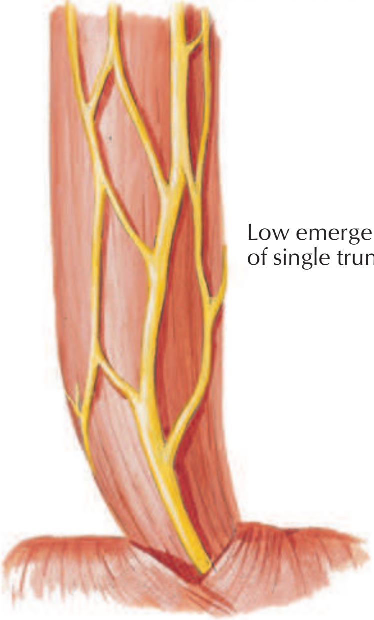
Single anterior trunk dividing just above respiratory diaphragm



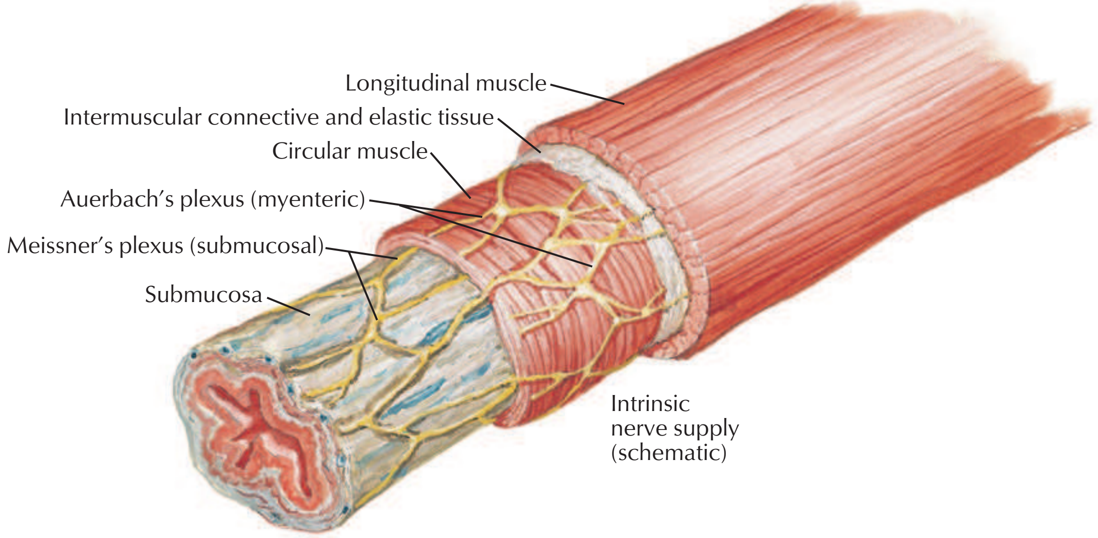
Multiple posterior trunks



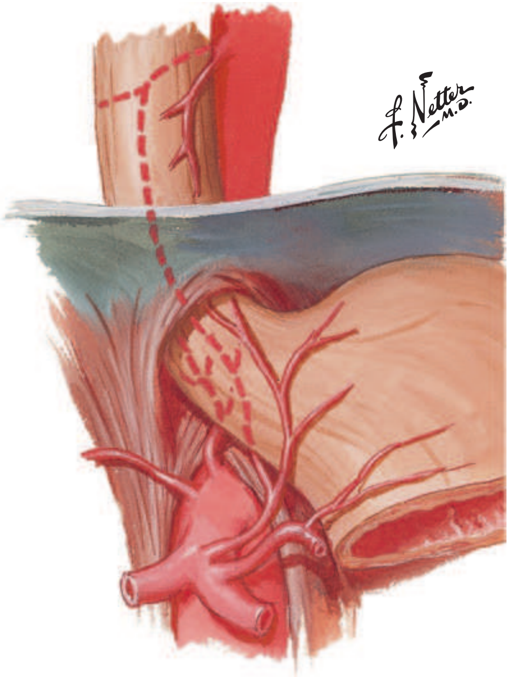
High emergence of single trunk



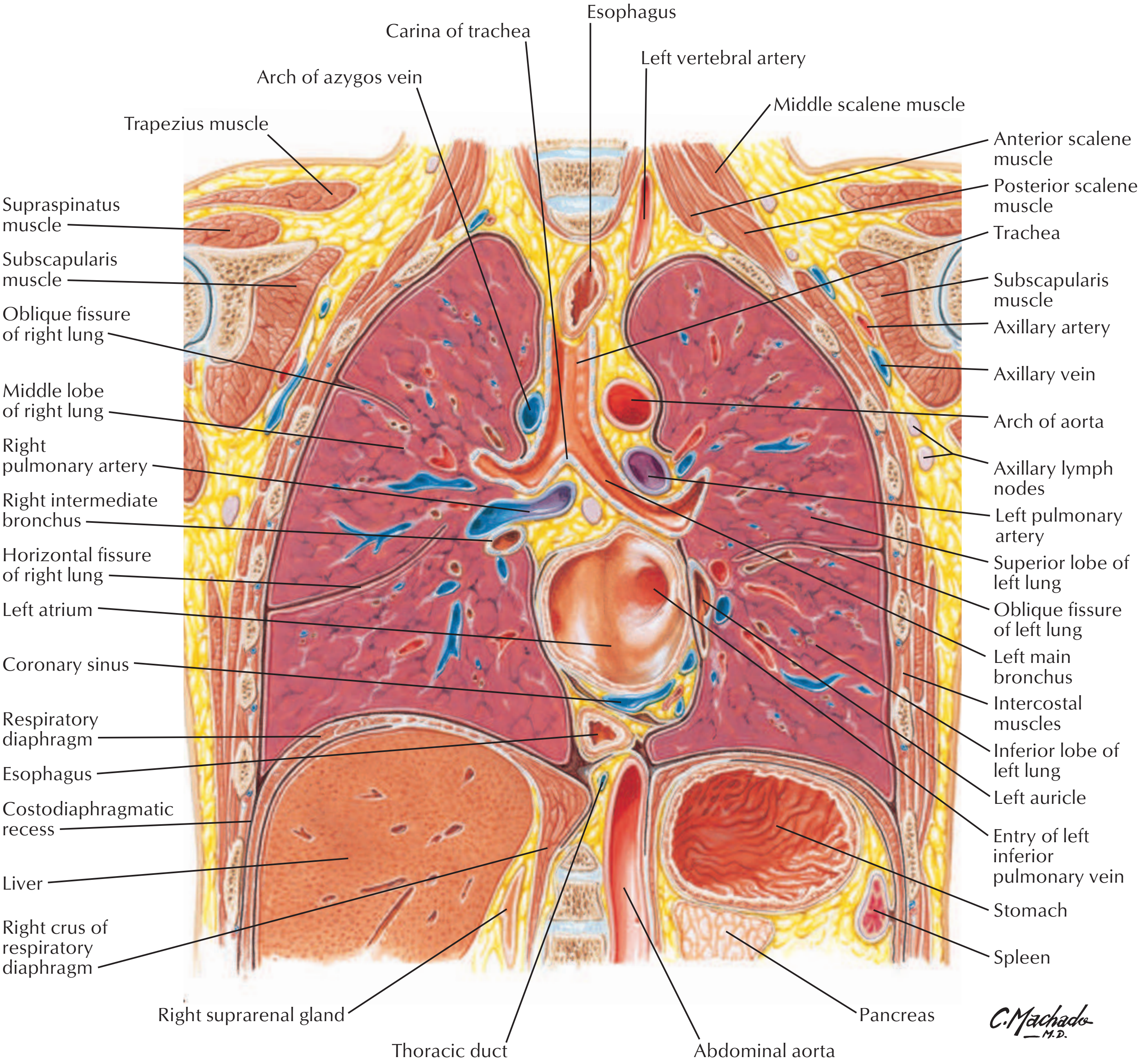
Low emergence of single trunk


Longitudinal muscle
Intermuscular connective and elastic tissue
Circular muscle
Auerbach's plexus (myenteric)
Meissner's plexus (submucosal)
Submucosa

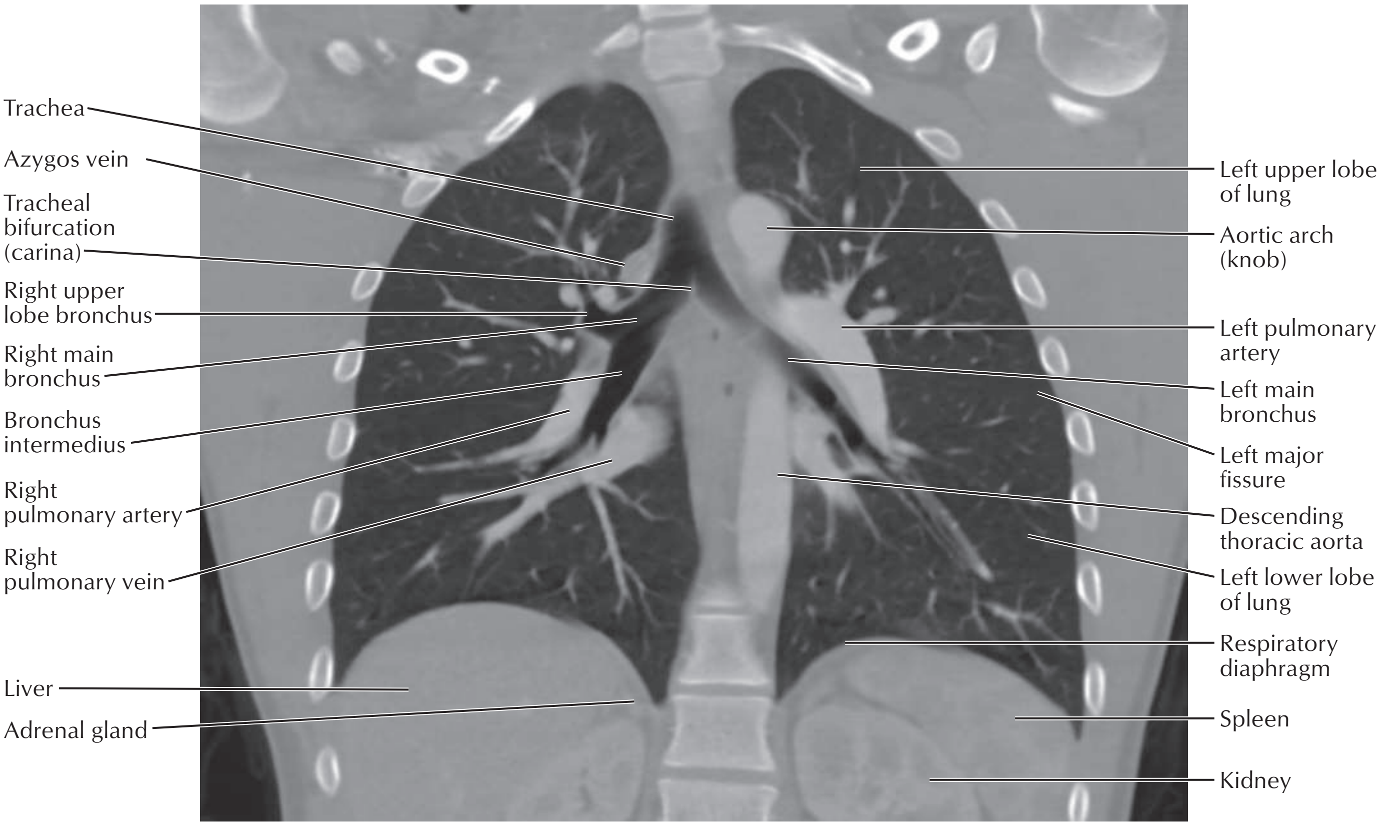
Intrinsic nerve supply (schematic)



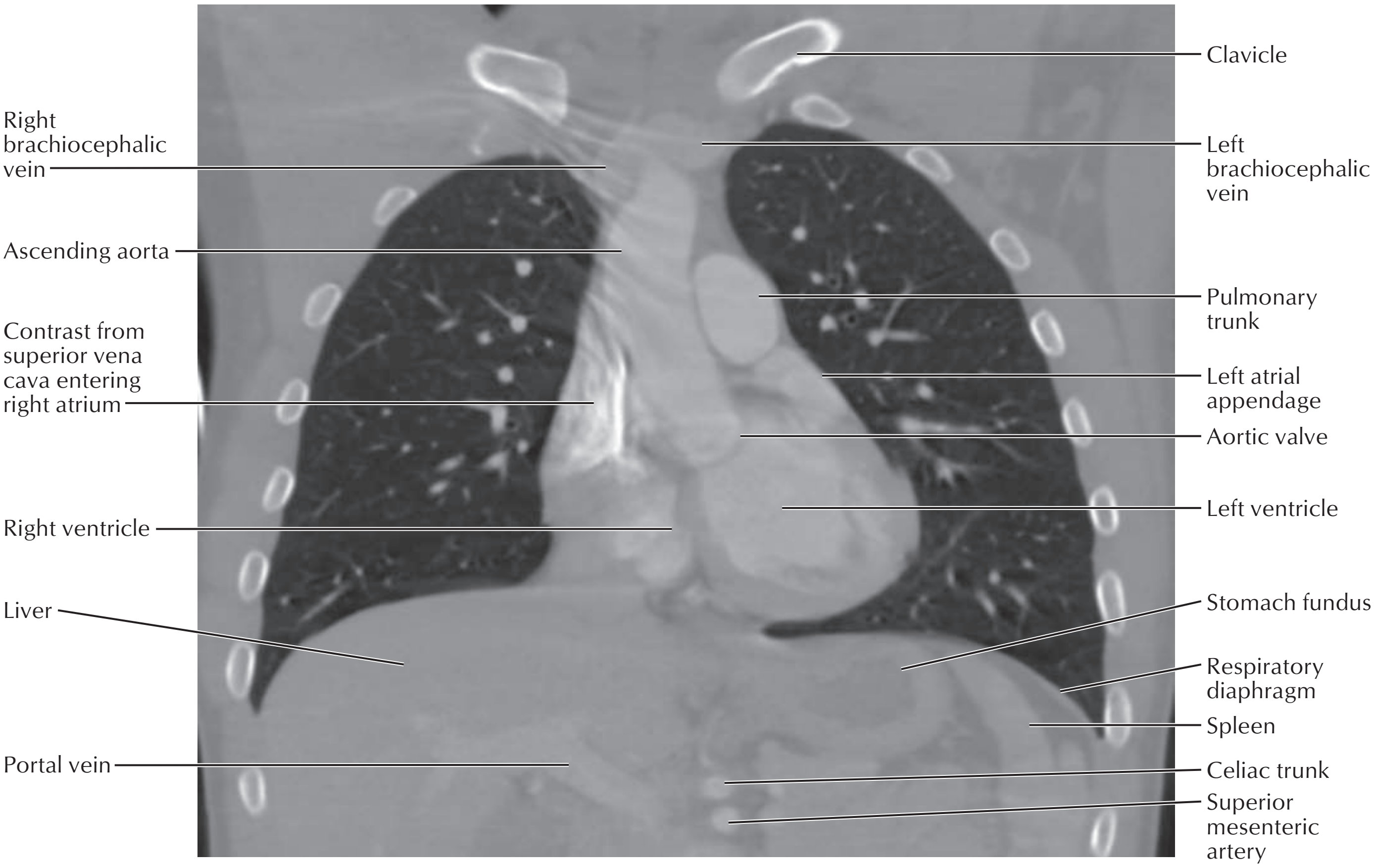
Common variations: Esophageal branches may originate from left inferior phrenic artery and/or directly from celiac trunk. Branches to abdominal esophagus may also come from splenic or short gastric arteries.


Esophagus
Carina of trachea
Left vertebral artery
Arch of azygos vein
Middle scalene muscle
Trapezius muscle
Anterior scalene muscle
Supraspinatus muscle
Posterior scalene muscle
Trachea
Subscapularis muscle
Subscapularis muscle
Oblique fissure of right lung
Axillary artery
Axillary vein
Middle lobe of right lung
Arch of aorta
Right pulmonary artery
Axillary lymph nodes
Right intermediate bronchus
Left pulmonary artery
Horizontal fissure of right lung
Superior lobe of left lung
Left atrium
Oblique fissure of left lung
Left main bronchus
Coronary sinus
Intercostal muscles
Respiratory diaphragm
Inferior lobe of left lung
Esophagus
Left auricle
Costodiaphragmatic recess
Entry of left inferior pulmonary vein
Liver
Stomach
Right crus of respiratory diaphragm
Spleen
Right suprarenal gland
Pancreas
Thoracic duct
Abdominal aorta
C.Machado M.D.

Contrast windowed to accentuate lungs and bones


Trachea
Azygos vein
Tracheal bifurcation (carina)
Right upper lobe bronchus
Right main bronchus
Bronchus intermedius
Right pulmonary artery
Right pulmonary vein
Liver
Adrenal gland
Left upper lobe of lung
Aortic arch (knob)
Left pulmonary artery
Left main bronchus
Left major fissure
Descending thoracic aorta
Left lower lobe of lung
Respiratory diaphragm
Spleen
Kidney

Contrast windowed to accentuate lungs and bones


Right brachiocephalic vein
Ascending aorta
Contrast from superior vena cava entering right atrium
Right ventricle
Liver
Portal vein
Clavicle
Left brachiocephalic vein
Pulmonary trunk
Left atrial appendage
Aortic valve
Left ventricle
Stomach fundus
Respiratory diaphragm
Spleen
Celiac trunk
Superior mesenteric artery

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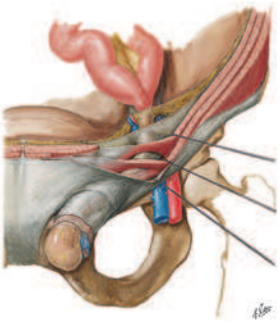
ABDOMEN

5

Surface Anatomy 249
Body Wall 250-269
Peritoneal Cavity 270-275
Viscera (Gut) 276-283
Viscera (Accessory Organs) 284-289
Visceral Vasculature 290-299
Innervation 300-310
Kidneys and Suprarenal Glands 311-324
Lymphatics 325
Regional Scans 326-327
Cross-Sectional Anatomy 328-332
Structures with High Clinical Significance Tables 5.1-5.2
Muscle Table Table 5.3
Electronic Bonus Plates BP58-BP87

ELECTRONIC BONUS PLATES

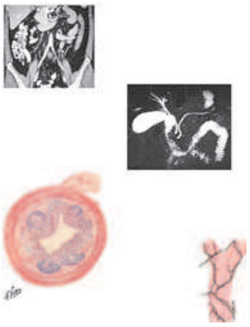
BP58 Inguinal and Femoral Regions



BP59 Indirect Inguinal Hernia

BP60 Variations in Position and Contour of Stomach in Relation to Body Habitus

BP61 Layers of Duodenal Wall



BP62 CT and MRCP Showing Appendix, Gallbladder, and Ducts; Nerve Branches of Hepatic Artery

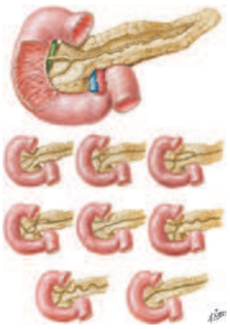
BP63 Topography of Liver

BP64 Variations in Form of Liver

BP65 Sigmoid Colon: Variations in Position

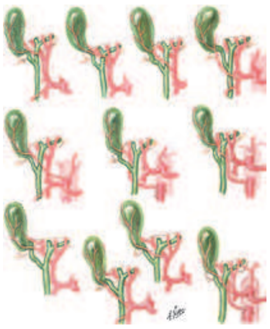
ELECTRONIC BONUS PLATES—*cont'd*

BP66 Variations in Arterial Supply to Cecum and Posterior Peritoneal Attachment of Cecum



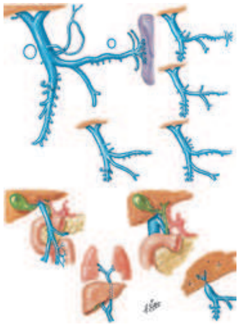
BP67 Variations in Pancreatic Duct

BP68 Variations in Cystic, Hepatic, and Pancreatic Ducts



BP69 Variations in Cystic Arteries

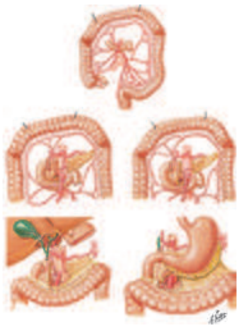
BP70 Variations in Hepatic Arteries



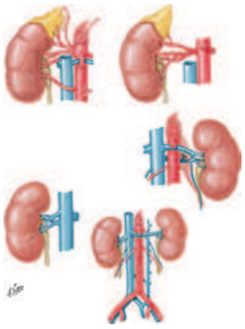
BP71 Variations and Anomalies of Hepatic Portal Vein

BP72 Variations in Celiac Trunk

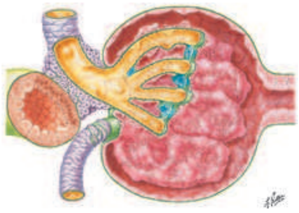
BP73 Variations in Colic Arteries



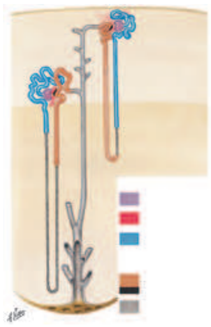
BP74 Variations in Colic Arteries (continued)



BP75 Variations in Renal Artery and Vein



BP76 Histology of Renal Corpuscle

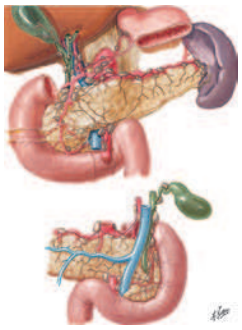


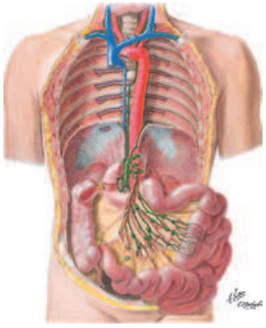
BP77 Nephron and Collecting Tubule: Schema

ELECTRONIC BONUS PLATES—*cont'd*

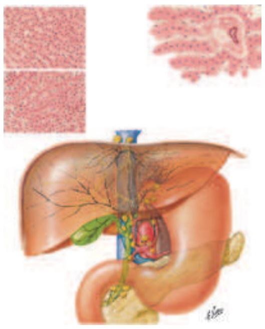
BP78 Blood Vessels in Parenchyma of Kidney: Schema

BP79 Lymph Vessels and Nodes of Stomach


BP80 Lymph Vessels and Nodes of Pancreas


BP81 Lymph Vessels and Nodes of Small Intestine

BP82 Lymph Vessels and Nodes of Large Intestine


BP83 Lymph Vessels and Nodes of Liver

BP84 Schematic Cross Section of Abdomen at Middle T12

BP85 Transverse Section of Abdomen: Level of L5, Near Transtubercular Plane

BP86 Transverse Section of Abdomen: Level of S1, Anterior Superior Iliac Spine

BP87 Axial CT Image of Upper Abdomen

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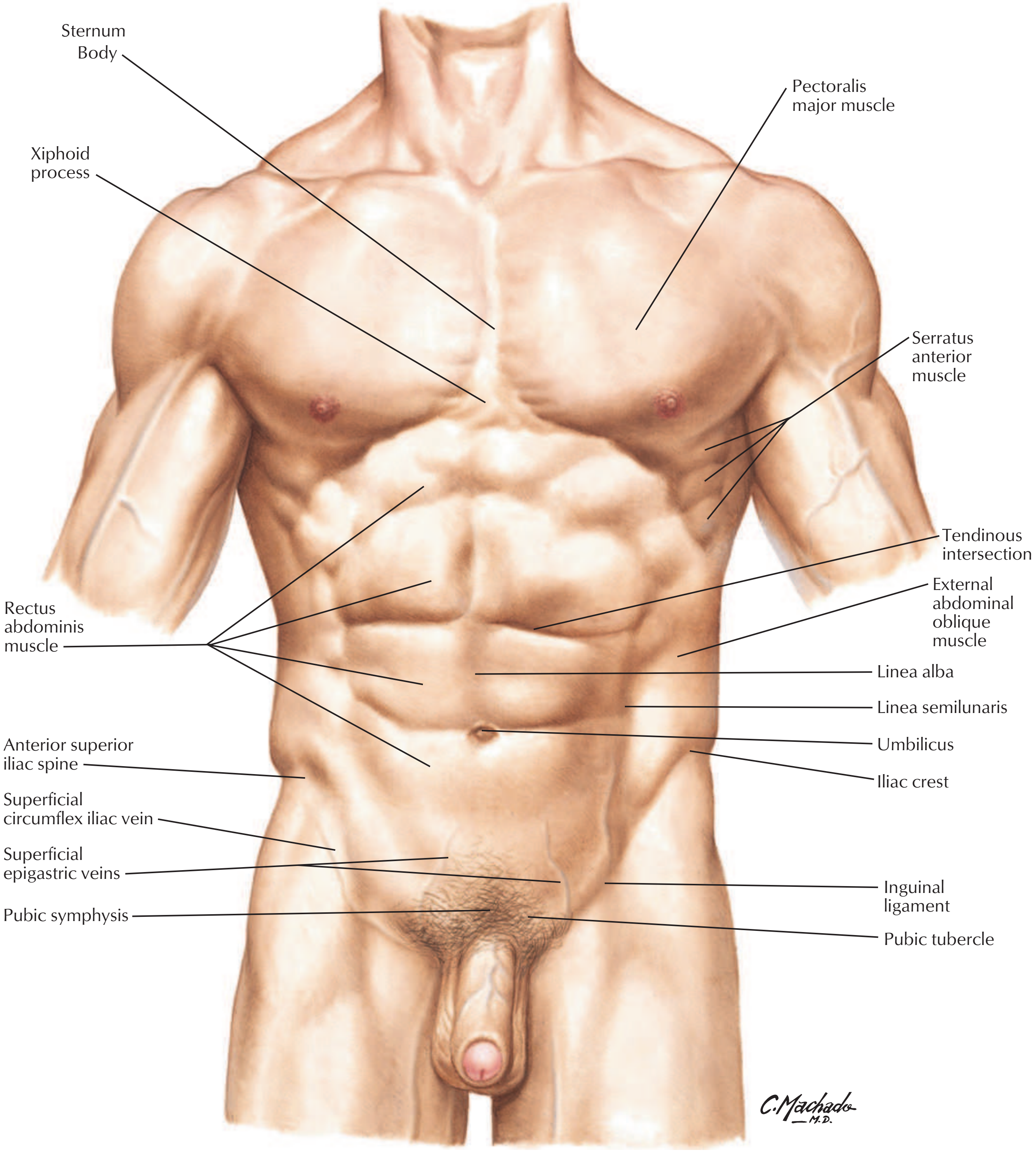
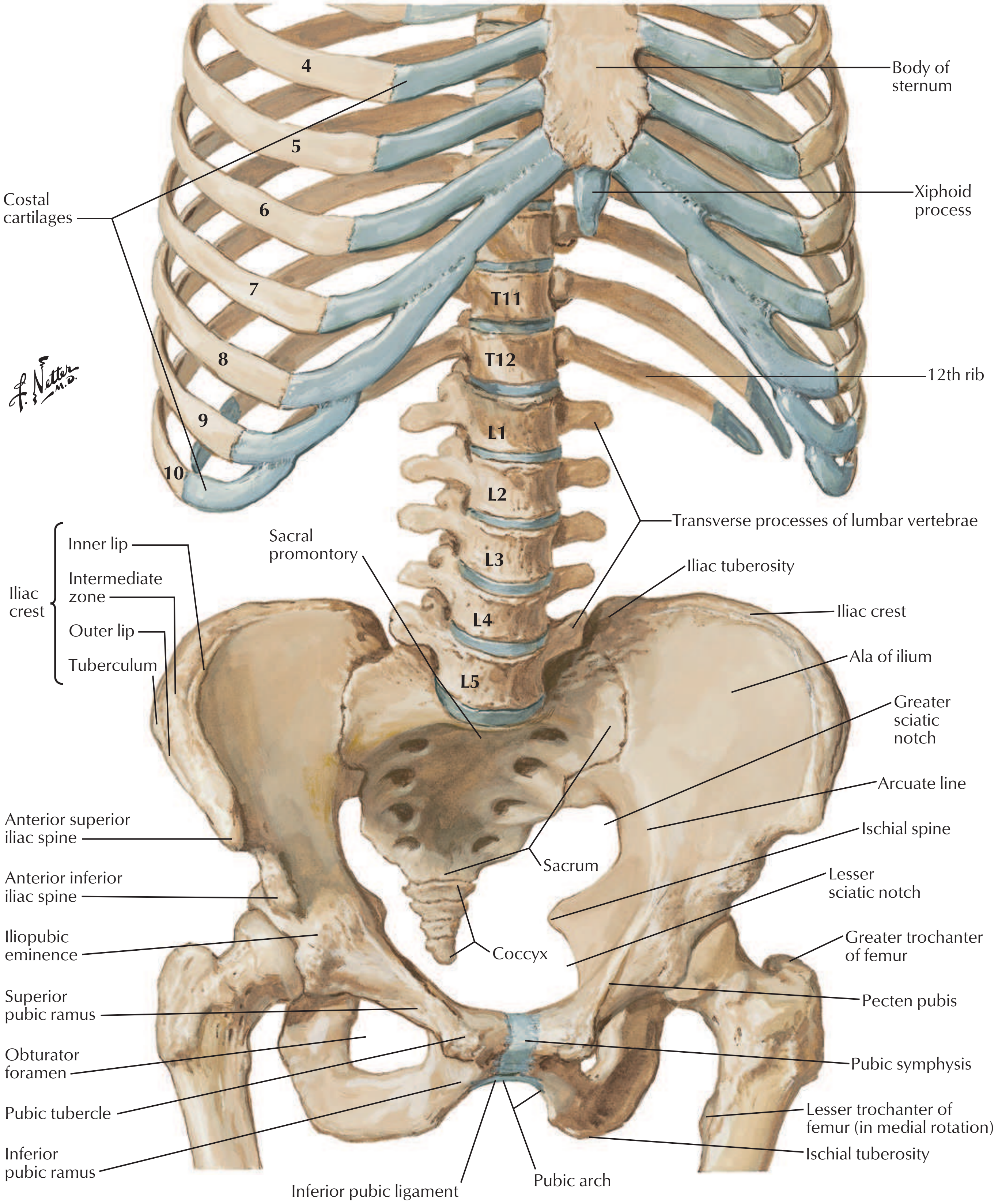
See also Plates 171, 252

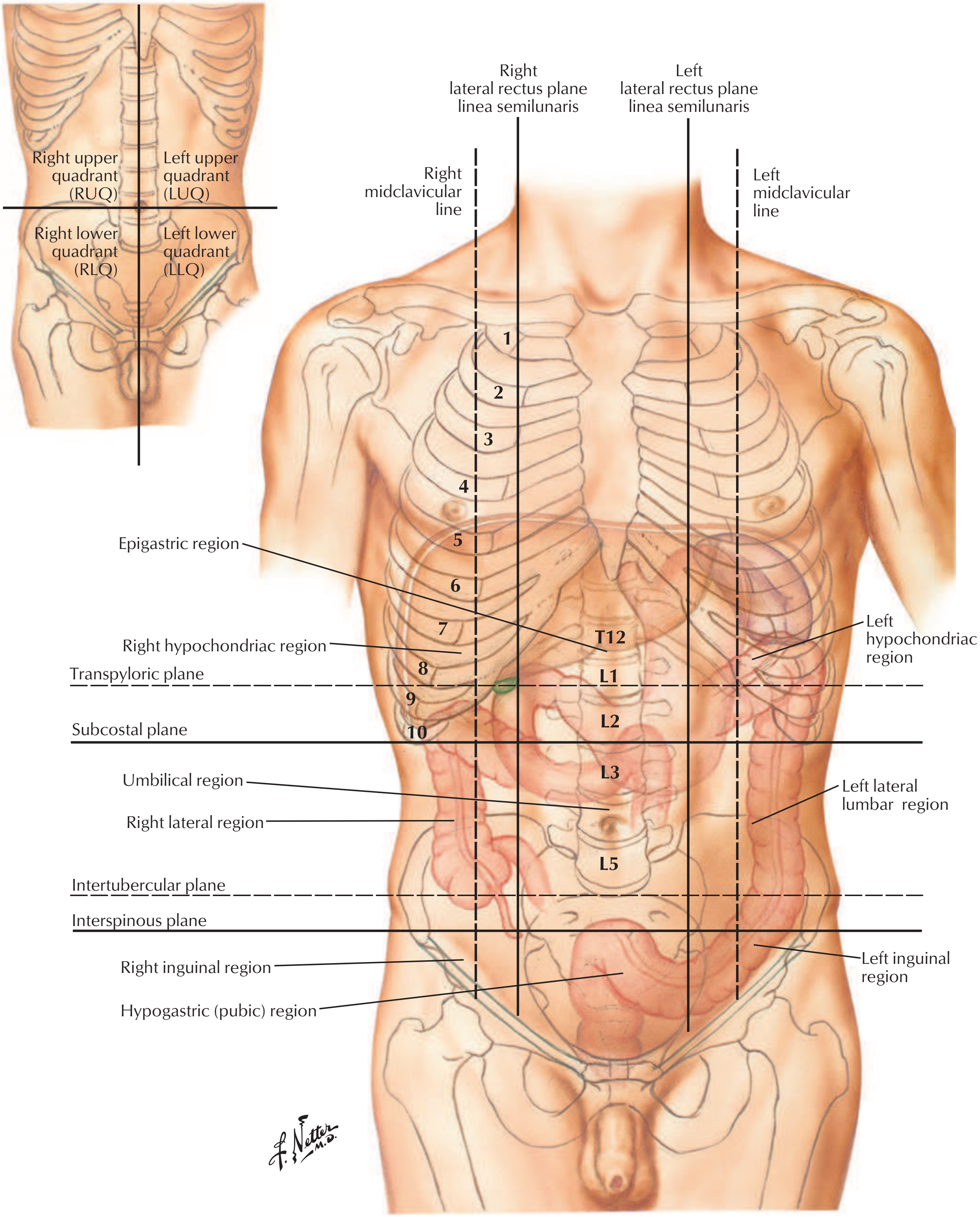

Sternum
Body
Pectoralis major muscle
Xiphoid process
Serratus anterior muscle
Tendinous intersection
External abdominal oblique muscle
Rectus abdominis muscle
Linea alba
Linea semilunaris
Umbilicus
Anterior superior iliac spine
Iliac crest
Superficial circumflex iliac vein
Superficial epigastric veins
Inguinal ligament
Pubic symphysis
Pubic tubercle
C.Machado M.D.

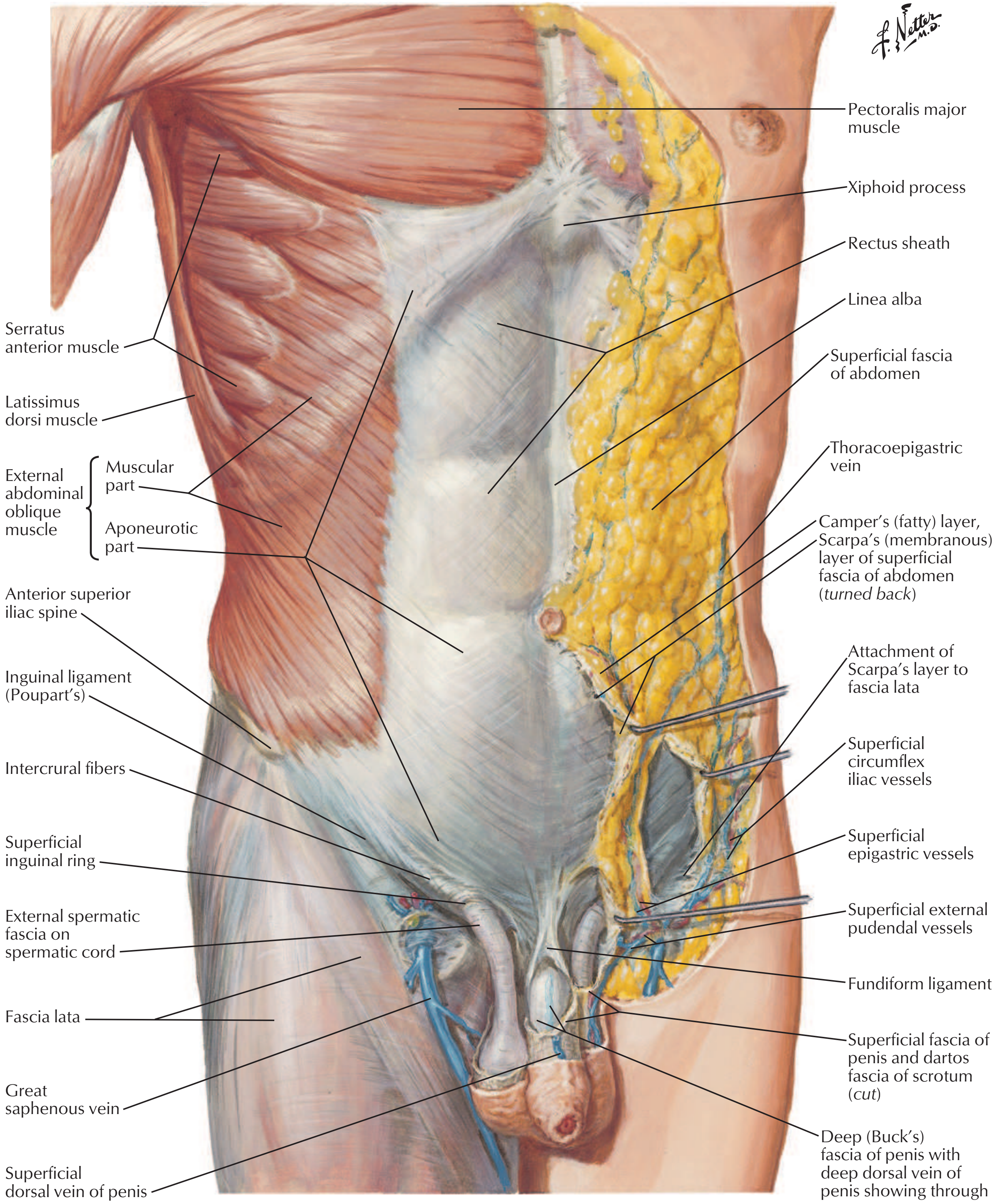
Bony Framework of Abdomen

See also Plates 192, 334



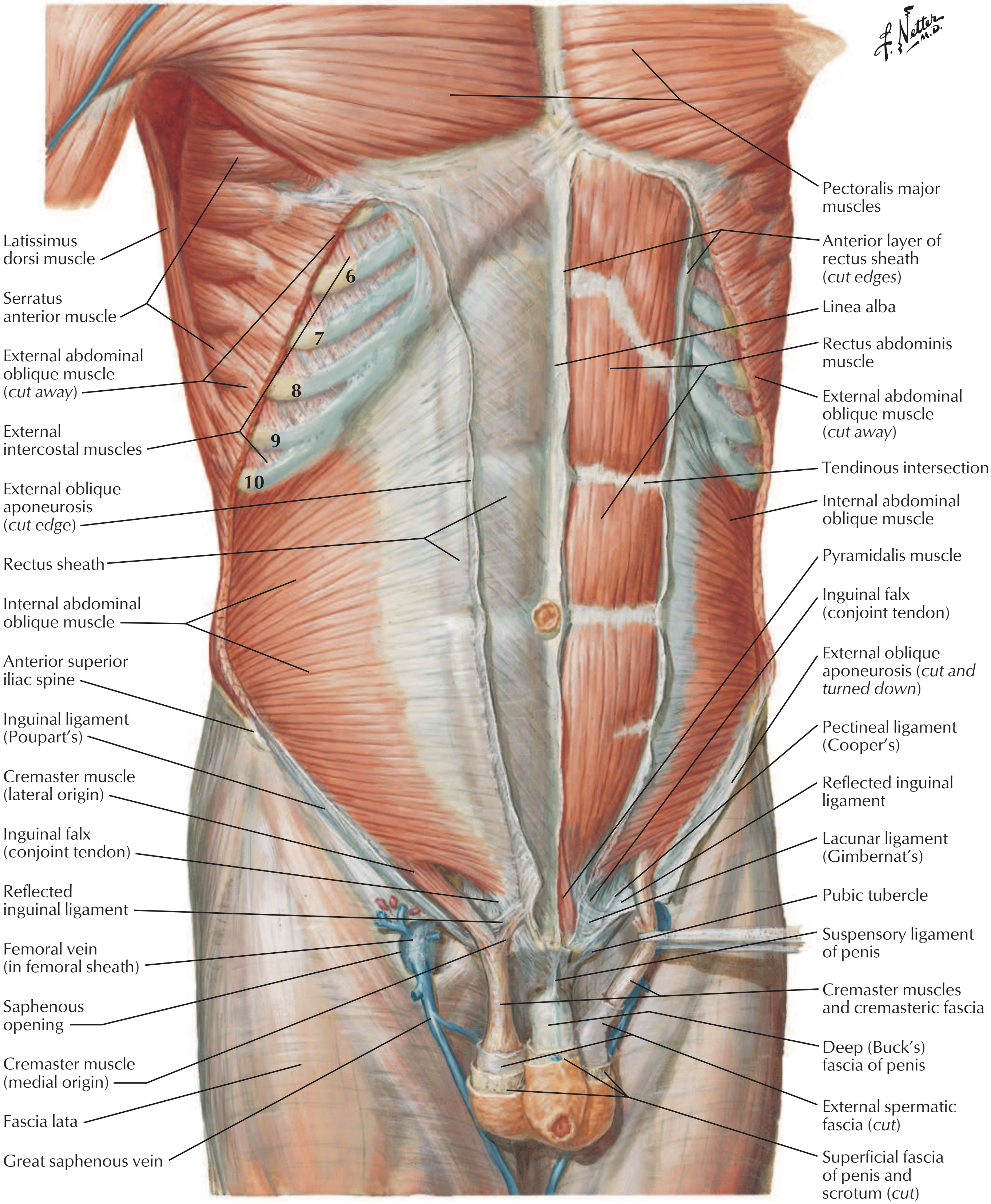
4
5
6
7
8
9
10
T11
T12
L1
L2
L3
L4
L5
Body of sternum
Xiphoid process
Costal cartilages
12th rib
Transverse processes of lumbar vertebrae
Iliac tuberosity
Iliac crest
Ala of ilium
Greater sciatic notch
Arcuate line
Ischial spine
Lesser sciatic notch
Greater trochanter of femur
Pecten pubis
Pubic symphysis
Lesser trochanter of femur (in medial rotation)
Ischial tuberosity
Pubic arch
Inferior pubic ligament
Iliac crest
Inner lip
Intermediate zone
Outer lip
Tuberculum
Sacral promontory
Sacrum
Coccyx
Anterior superior iliac spine
Anterior inferior iliac spine
Iliopubic eminence
Superior pubic ramus
Obturator foramen
Pubic tubercle
Inferior pubic ramus


Right upper quadrant (RUQ)
Left upper quadrant (LUQ)
Right lower quadrant (RLQ)
Left lower quadrant (LLQ)
Right lateral rectus plane linea semilunaris
Left lateral rectus plane linea semilunaris
Right midclavicular line
Left midclavicular line
1
2
3
4
5
6
7
8
9
10
T12
L1
L2
L3
L5
Epigastric region
Right hypochondriac region
Left hypochondriac region
Transpyloric plane
Subcostal plane
Umbilical region
Right lateral region
Left lateral lumbar region
Intertubercular plane
Interspinous plane
Right inguinal region
Left inguinal region
Hypogastric (pubic) region

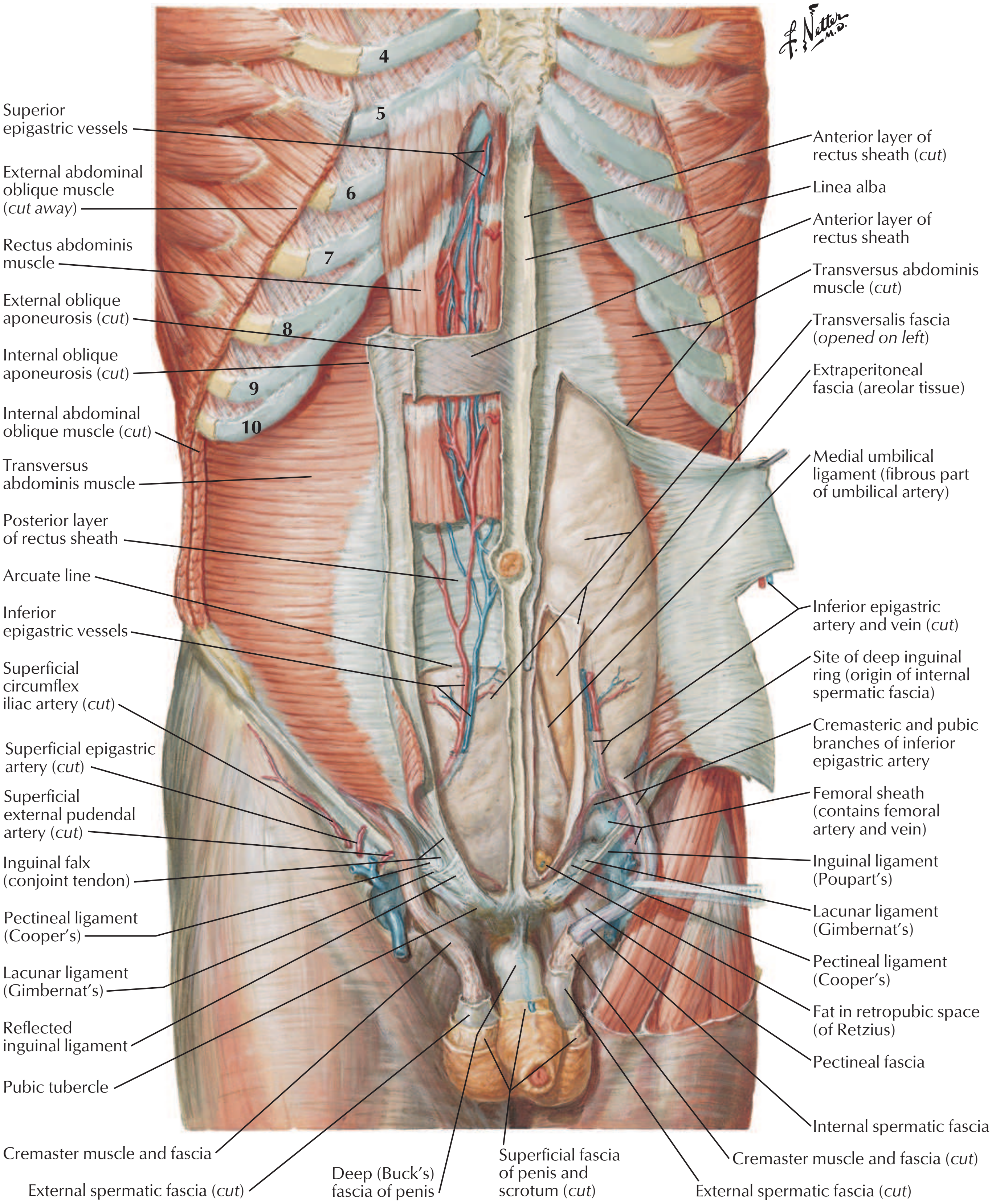

Pectoralis major muscle
Xiphoid process
Rectus sheath
Linea alba
Superficial fascia of abdomen
Thoracoepigastric vein
Camper's (fatty) layer, Scarpa's (membranous) layer of superficial fascia of abdomen (*turned back*)
Attachment of Scarpa's layer to fascia lata
Superficial circumflex iliac vessels
Superficial epigastric vessels
Superficial external pudendal vessels
Fundiform ligament
Superficial fascia of penis and dartos fascia of scrotum (*cut*)
Deep (Buck's) fascia of penis with deep dorsal vein of penis showing through
Serratus anterior muscle
Latissimus dorsi muscle
External abdominal oblique muscle
Muscular part
Aponeurotic part
Anterior superior iliac spine
Inguinal ligament (Poupart's)
Intercrural fibers
Superficial inguinal ring
External spermatic fascia on spermatic cord
Fascia lata
Great saphenous vein
Superficial dorsal vein of penis

Anterior Abdominal Wall: Intermediate Dissection

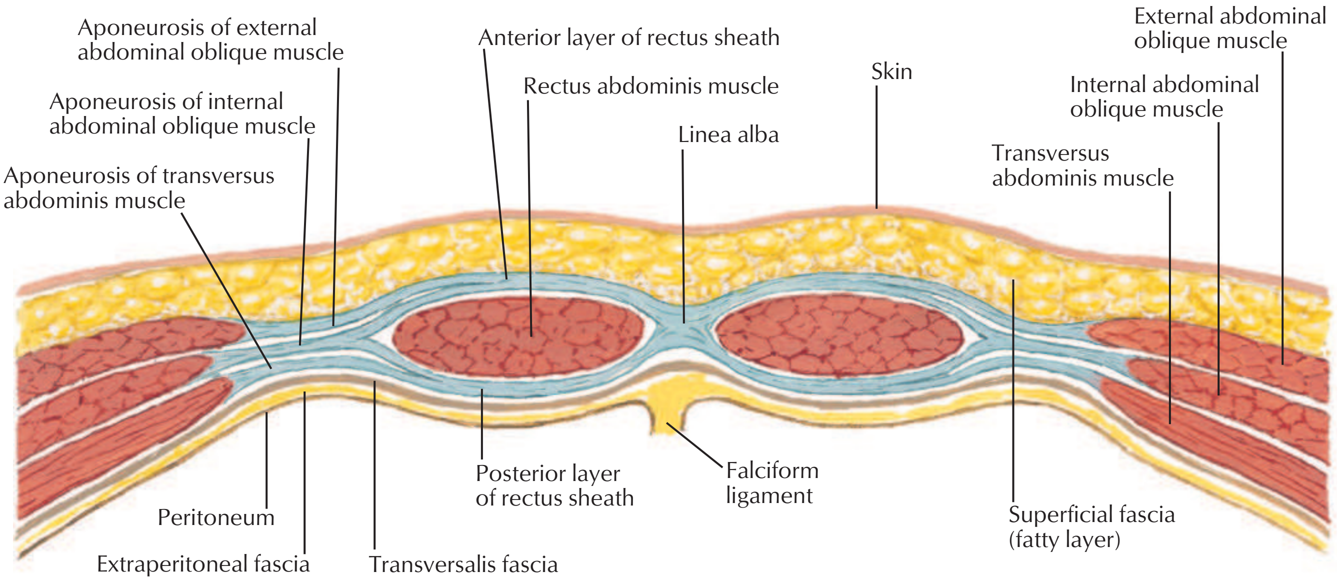
See also Plates 194, 195


Latissimus dorsi muscle
Serratus anterior muscle
External abdominal oblique muscle (*cut away*)
External intercostal muscles
External oblique aponeurosis (*cut edge*)
Rectus sheath
Internal abdominal oblique muscle
Anterior superior iliac spine
Inguinal ligament (Poupart's)
Cremaster muscle (lateral origin)
Inguinal falx (conjoint tendon)
Reflected inguinal ligament
Femoral vein (in femoral sheath)
Saphenous opening
Cremaster muscle (medial origin)
Fascia lata
Great saphenous vein
6
7
8
9
10
Pectoralis major muscles
Anterior layer of rectus sheath (*cut edges*)
Linea alba
Rectus abdominis muscle
External abdominal oblique muscle (*cut away*)
Tendinous intersection
Internal abdominal oblique muscle
Pyramidalis muscle
Inguinal falx (conjoint tendon)
External oblique aponeurosis (*cut and turned down*)
Pectineal ligament (Cooper's)
Reflected inguinal ligament
Lacunar ligament (Gimbernat's)
Pubic tubercle
Suspensory ligament of penis
Cremaster muscles and cremasteric fascia
Deep (Buck's) fascia of penis
External spermatic fascia (*cut*)
Superficial fascia of penis and scrotum (*cut*)

See also **Plates 195**, **258**

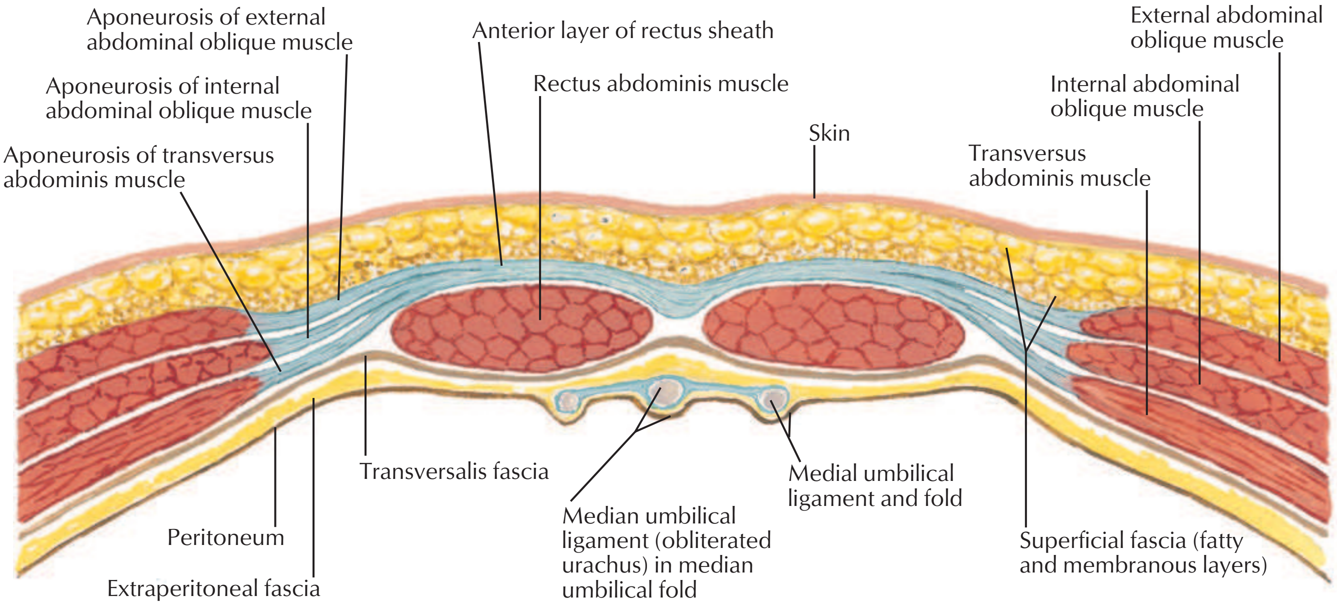

4
5
6
7
8
9
10
Superior epigastric vessels
External abdominal oblique muscle (*cut away*)
Rectus abdominis muscle
External oblique aponeurosis (*cut*)
Internal oblique aponeurosis (*cut*)
Internal abdominal oblique muscle (*cut*)
Transversus abdominis muscle
Posterior layer of rectus sheath
Arcuate line
Inferior epigastric vessels
Superficial circumflex iliac artery (*cut*)
Superficial epigastric artery (*cut*)
Superficial external pudendal artery (*cut*)
Inguinal falx (conjoint tendon)
Pectineal ligament (Cooper's)
Lacunar ligament (Gimbernat's)
Reflected inguinal ligament
Pubic tubercle
Cremaster muscle and fascia
External spermatic fascia (*cut*)
Deep (Buck's) fascia of penis
Superficial fascia of penis and scrotum (*cut*)
External spermatic fascia (*cut*)
Cremaster muscle and fascia (*cut*)
Internal spermatic fascia
Pectineal fascia
Fat in retropubic space (of Retzius)
Pectineal ligament (Cooper's)
Lacunar ligament (Gimbernat's)
Inguinal ligament (Poupart's)
Femoral sheath (contains femoral artery and vein)
Cremasteric and pubic branches of inferior epigastric artery
Site of deep inguinal ring (origin of internal spermatic fascia)
Inferior epigastric artery and vein (*cut*)
Medial umbilical ligament (fibrous part of umbilical artery)
Extraperitoneal fascia (areolar tissue)
Transversalis fascia (*opened on left*)
Transversus abdominis muscle (*cut*)
Anterior layer of rectus sheath
Linea alba
Anterior layer of rectus sheath (*cut*)

Section above arcuate line


Aponeurosis of external abdominal oblique muscle
Aponeurosis of internal abdominal oblique muscle
Aponeurosis of transversus abdominis muscle
Anterior layer of rectus sheath
Rectus abdominis muscle
Linea alba
Skin
External abdominal oblique muscle
Internal abdominal oblique muscle
Transversus abdominis muscle
Posterior layer of rectus sheath
Falciform ligament
Superficial fascia (fatty layer)
Peritoneum
Extraperitoneal fascia
Transversalis fascia

Aponeurosis of internal abdominal oblique muscle splits to form anterior and posterior layers of rectus sheath. Aponeurosis of external abdominal oblique muscle joins anterior layer of sheath; aponeurosis of transversus abdominis muscle joins posterior layer. Anterior and posterior layers of rectus sheath unite medially to form linea alba.

Section below arcuate line


Aponeurosis of external abdominal oblique muscle
Aponeurosis of internal abdominal oblique muscle
Aponeurosis of transversus abdominis muscle
Anterior layer of rectus sheath
Rectus abdominis muscle
Skin
External abdominal oblique muscle
Internal abdominal oblique muscle
Transversus abdominis muscle
Transversalis fascia
Medial umbilical ligament and fold
Median umbilical ligament (obliterated urachus) in median umbilical fold
Superficial fascia (fatty and membranous layers)
Peritoneum
Extraperitoneal fascia

Aponeurosis of internal abdominal oblique muscle does not split at this level but passes completely anterior to rectus abdominis muscle and is fused there with both aponeurosis of external abdominal oblique muscle and that of transversus abdominis muscle. Thus, posterior wall of rectus sheath is absent below arcuate line, leaving only transversalis fascia.

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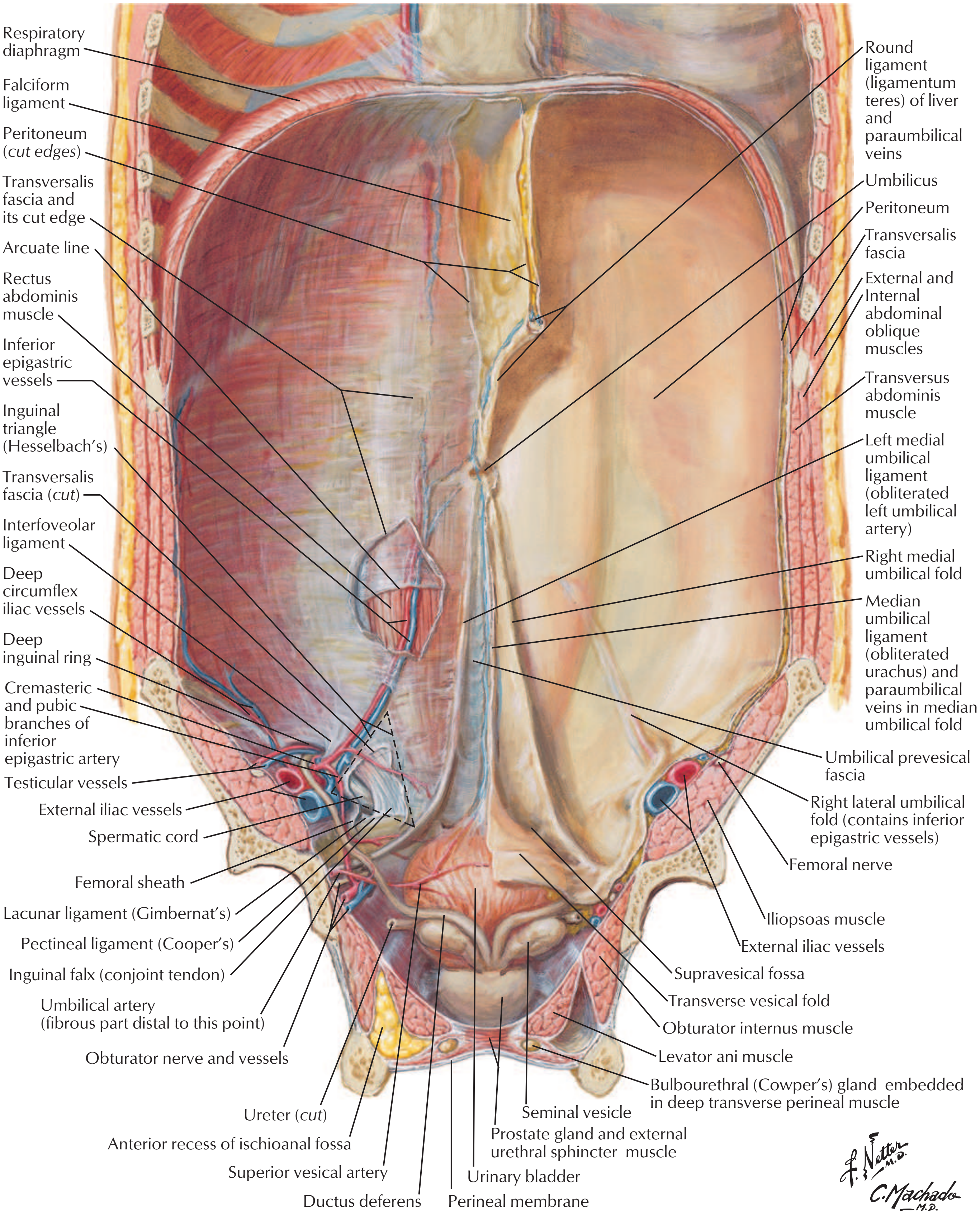
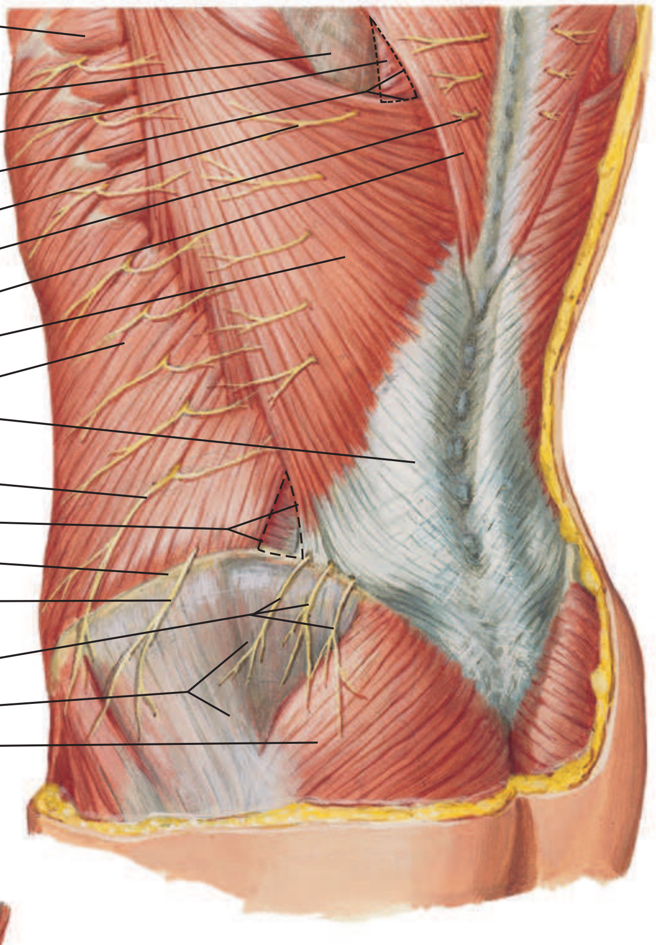
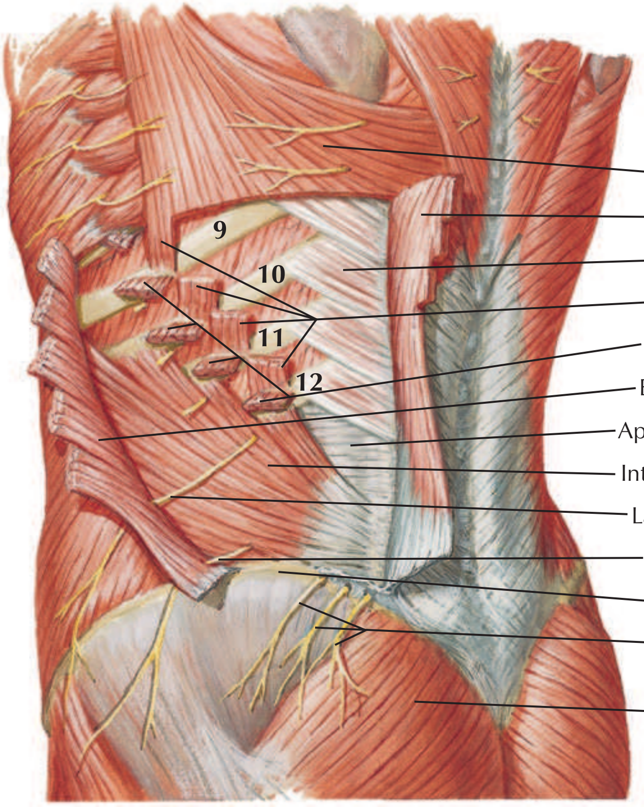
See also **Plate 366**

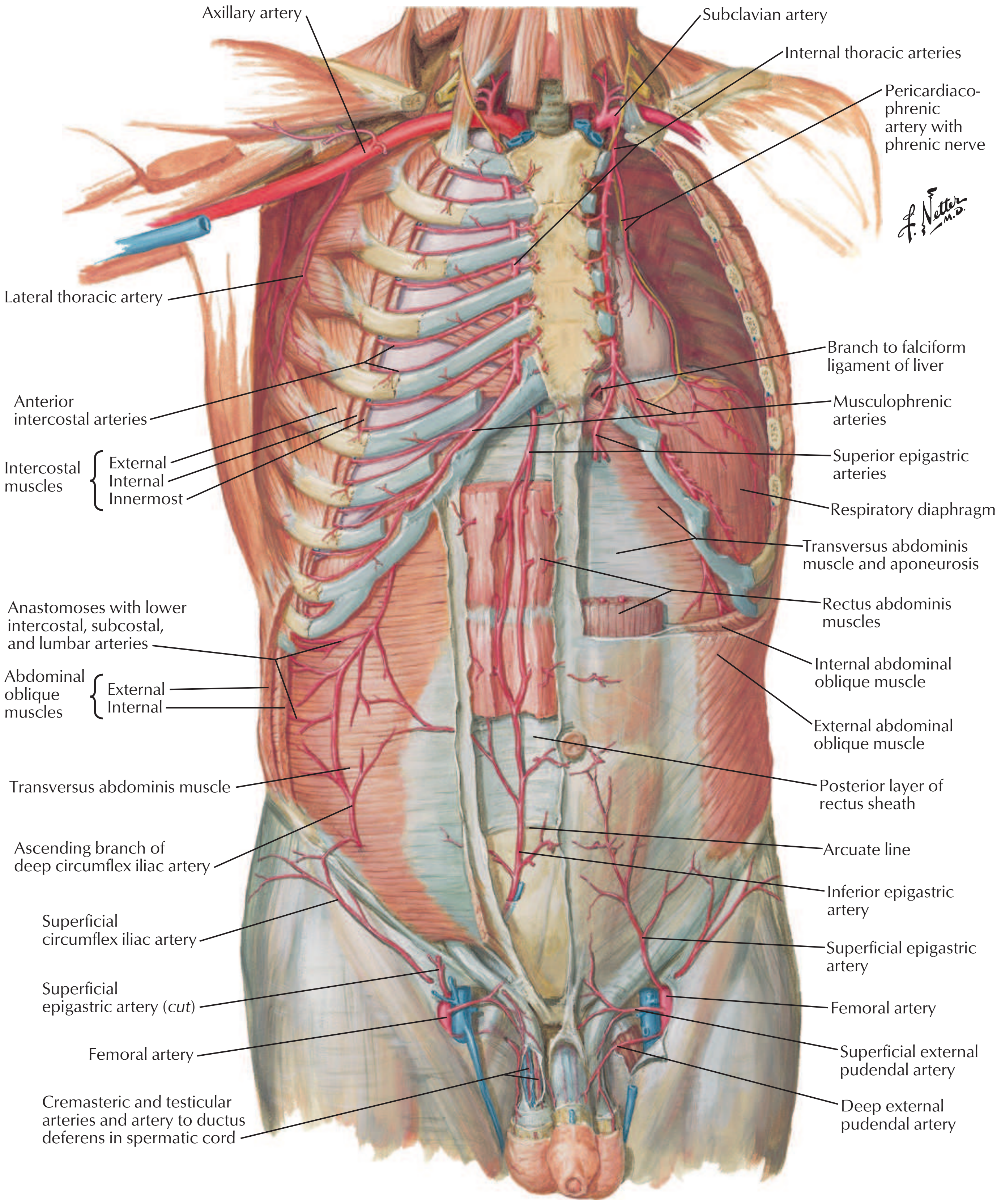

Respiratory diaphragm
Falciform ligament
Peritoneum (*cut edges*)
Transversalis fascia and its cut edge
Arcuate line
Rectus abdominis muscle
Inferior epigastric vessels
Inguinal triangle (Hesselbach's)
Transversalis fascia (*cut*)
Interfoveolar ligament
Deep circumflex iliac vessels
Deep inguinal ring
Cremasteric and pubic branches of inferior epigastric artery
Testicular vessels
External iliac vessels
Spermatic cord
Femoral sheath
Lacunar ligament (Gimbernat's)
Pectineal ligament (Cooper's)
Inguinal falx (conjoint tendon)
Umbilical artery (fibrous part distal to this point)
Obturator nerve and vessels
Ureter (*cut*)
Anterior recess of ischioanal fossa
Superior vesical artery
Ductus deferens
Perineal membrane
Urinary bladder
Prostate gland and external urethral sphincter muscle
Seminal vesicle
Bulbourethral (Cowper's) gland embedded in deep transverse perineal muscle
Levator ani muscle
Obturator internus muscle
Transverse vesical fold
Supravesical fossa
External iliac vessels
Iliopsoas muscle
Femoral nerve
Right lateral umbilical fold (contains inferior epigastric vessels)
Umbilical prevesical fascia
Median umbilical ligament (obliterated urachus) and paraumbilical veins in median umbilical fold
Right medial umbilical fold
Left medial umbilical ligament (obliterated left umbilical artery)
Transversus abdominis muscle
External and Internal abdominal oblique muscles
Transversalis fascia
Peritoneum
Umbilicus
Round ligament (ligamentum teres) of liver and paraumbilical veins
F. Netter M.D.
C. Machado M.D.


Serratus anterior muscle
Infraspinatus fascia
Rhomboid major muscle
Triangle of auscultation
Lateral cutaneous branch of posterior ramus of T7 spinal nerve
Medial cutaneous branch of posterior ramus of T7 spinal nerve
Trapezius muscle
Latissimus dorsi muscle
External abdominal oblique muscle
Thoracolumbar fascia (posterior layer)
Lateral cutaneous branch of subcostal nerve (anterior ramus of T12)
Lumbar triangle (of Petit)
Iliac crest
Lateral cutaneous branch of iliohypogastric nerve (L1)
Superior cluneal nerves (lateral cutaneous branches of posterior ramus of L1–3 spinal nerves)
Gluteal aponeurosis over gluteus medius muscle
Gluteus maximus muscle


9
10
11
12
Latissimus dorsi muscle
Latissimus dorsi muscle (cut and turned back)
Serratus posterior inferior muscle
Digitations of costal origin of latissimus dorsi muscle
Digitations of costal origin of external abdominal oblique muscle
External abdominal oblique muscle (cut and turned back)
Aponeurosis of transversus abdominis muscle
Internal abdominal oblique muscle
Lateral cutaneous branch of subcostal nerve (anterior ramus of T12)
Lateral cutaneous branch of iliohypogastric nerve (L1)
Iliac crest
Superior cluneal nerves (lateral cutaneous branches of posterior ramus of L1–L3 spinal nerves)
Gluteus maximus muscle

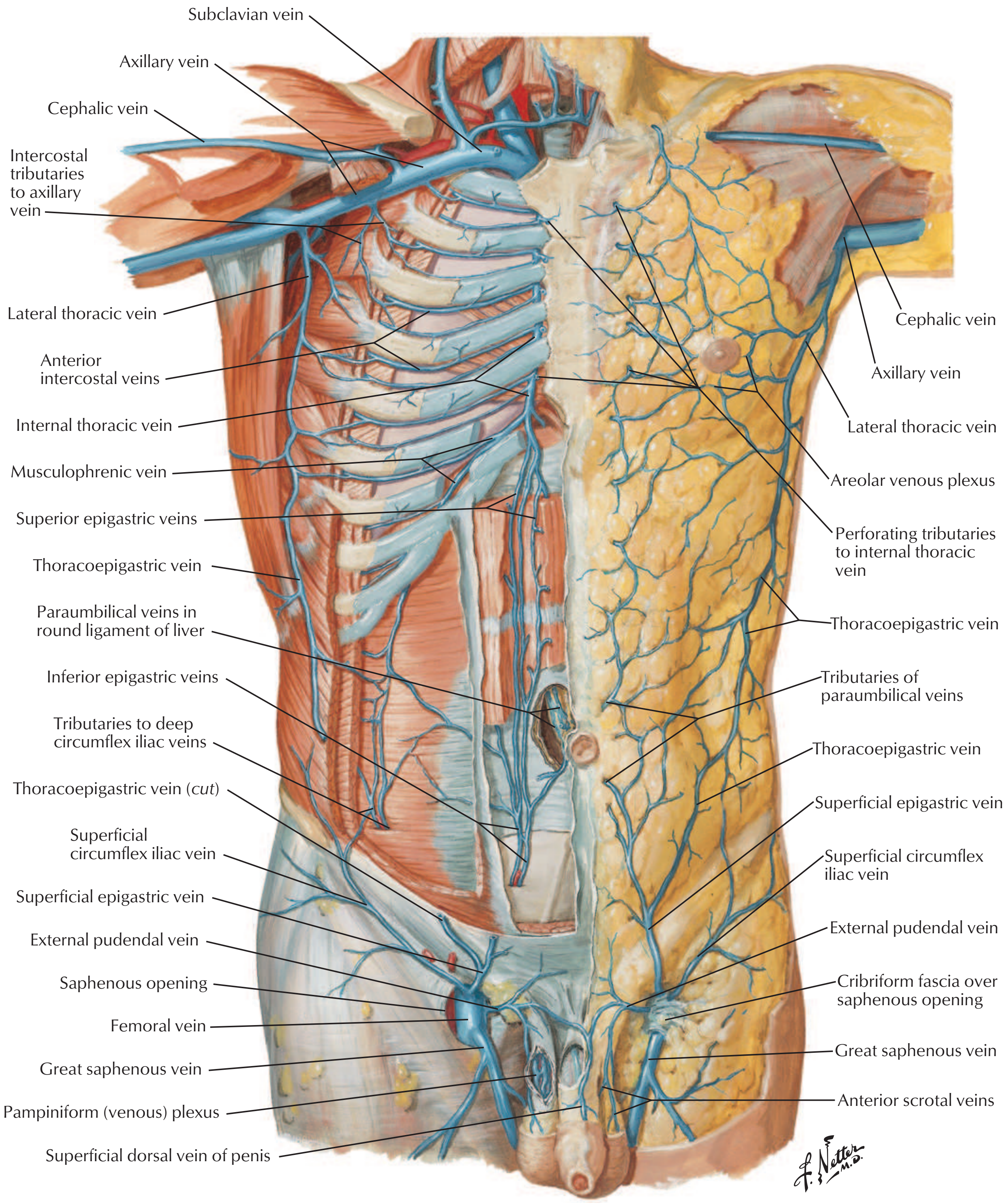
F. Netter M.D.

See also **Plate 254**


Axillary artery
Subclavian artery
Internal thoracic arteries
Pericardiaco-phrenic artery with phrenic nerve
Lateral thoracic artery
Anterior intercostal arteries
Intercostal muscles
External
Internal
Innermost
Branch to falciform ligament of liver
Musculophrenic arteries
Superior epigastric arteries
Respiratory diaphragm
Transversus abdominis muscle and aponeurosis
Rectus abdominis muscles
Anastomoses with lower intercostal, subcostal, and lumbar arteries
Abdominal oblique muscles
External
Internal
Internal abdominal oblique muscle
External abdominal oblique muscle
Transversus abdominis muscle
Posterior layer of rectus sheath
Ascending branch of deep circumflex iliac artery
Arcuate line
Inferior epigastric artery
Superficial circumflex iliac artery
Superficial epigastric artery
Superficial epigastric artery (cut)
Femoral artery
Femoral artery
Superficial external pudendal artery
Cremasteric and testicular arteries and artery to ductus deferens in spermatic cord
Deep external pudendal artery

Veins of Anterior Abdominal Wall

See also Plates 252, 254


Subclavian vein
Axillary vein
Cephalic vein
Intercostal tributaries to axillary vein
Lateral thoracic vein
Anterior intercostal veins
Internal thoracic vein
Musculophrenic vein
Superior epigastric veins
Thoracoepigastric vein
Paraumbilical veins in round ligament of liver
Inferior epigastric veins
Tributaries to deep circumflex iliac veins
Thoracoepigastric vein (*cut*)
Superficial circumflex iliac vein
Superficial epigastric vein
External pudendal vein
Saphenous opening
Femoral vein
Great saphenous vein
Pampiniform (venous) plexus
Superficial dorsal vein of penis
Cephalic vein
Axillary vein
Lateral thoracic vein
Areolar venous plexus
Perforating tributaries to internal thoracic vein
Thoracoepigastric vein
Tributaries of paraumbilical veins
Thoracoepigastric vein
Superficial epigastric vein
Superficial circumflex iliac vein
External pudendal vein
Cribriform fascia over saphenous opening
Great saphenous vein
Anterior scrotal veins
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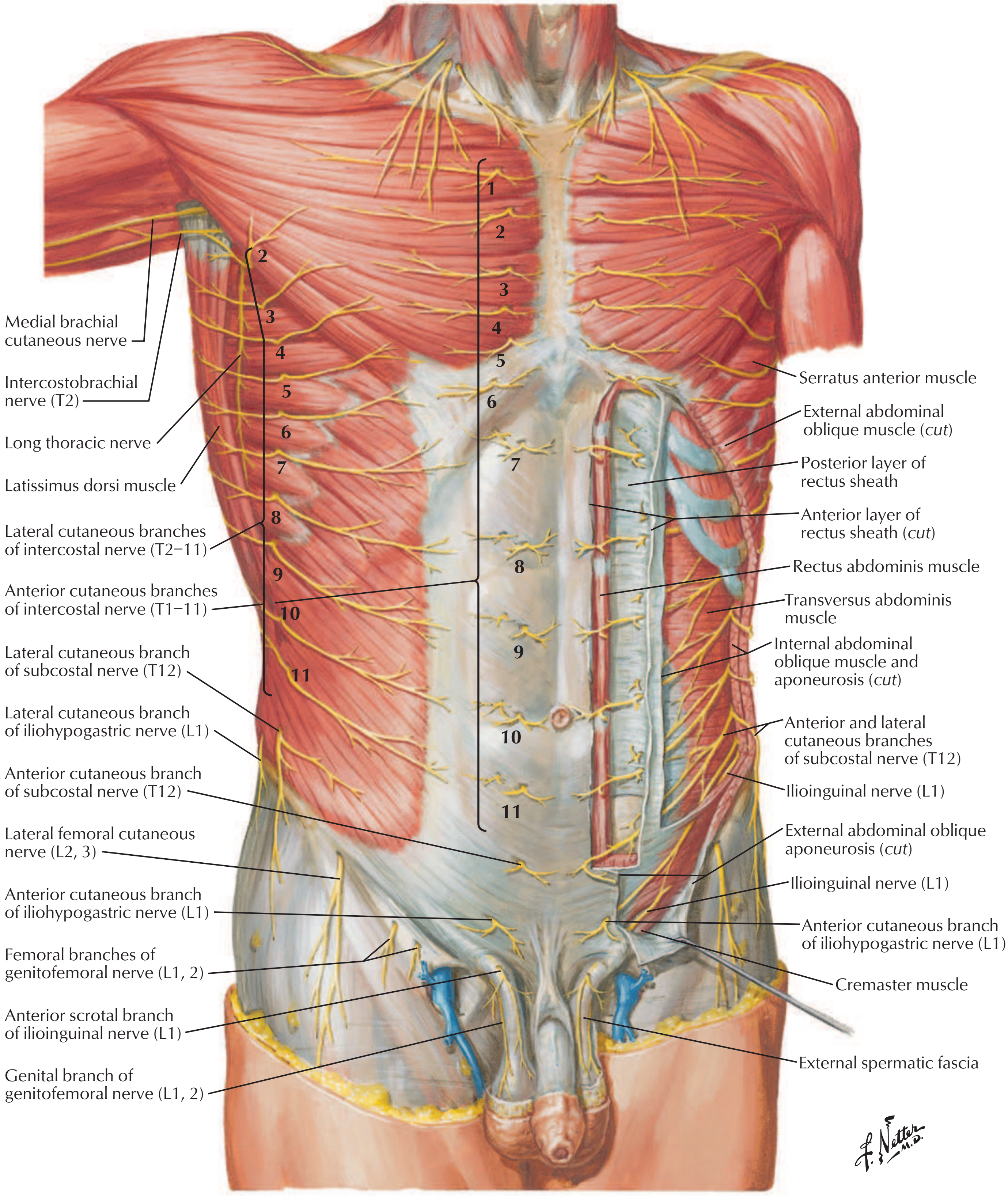
See also Plates 186, 194, 261


1
2
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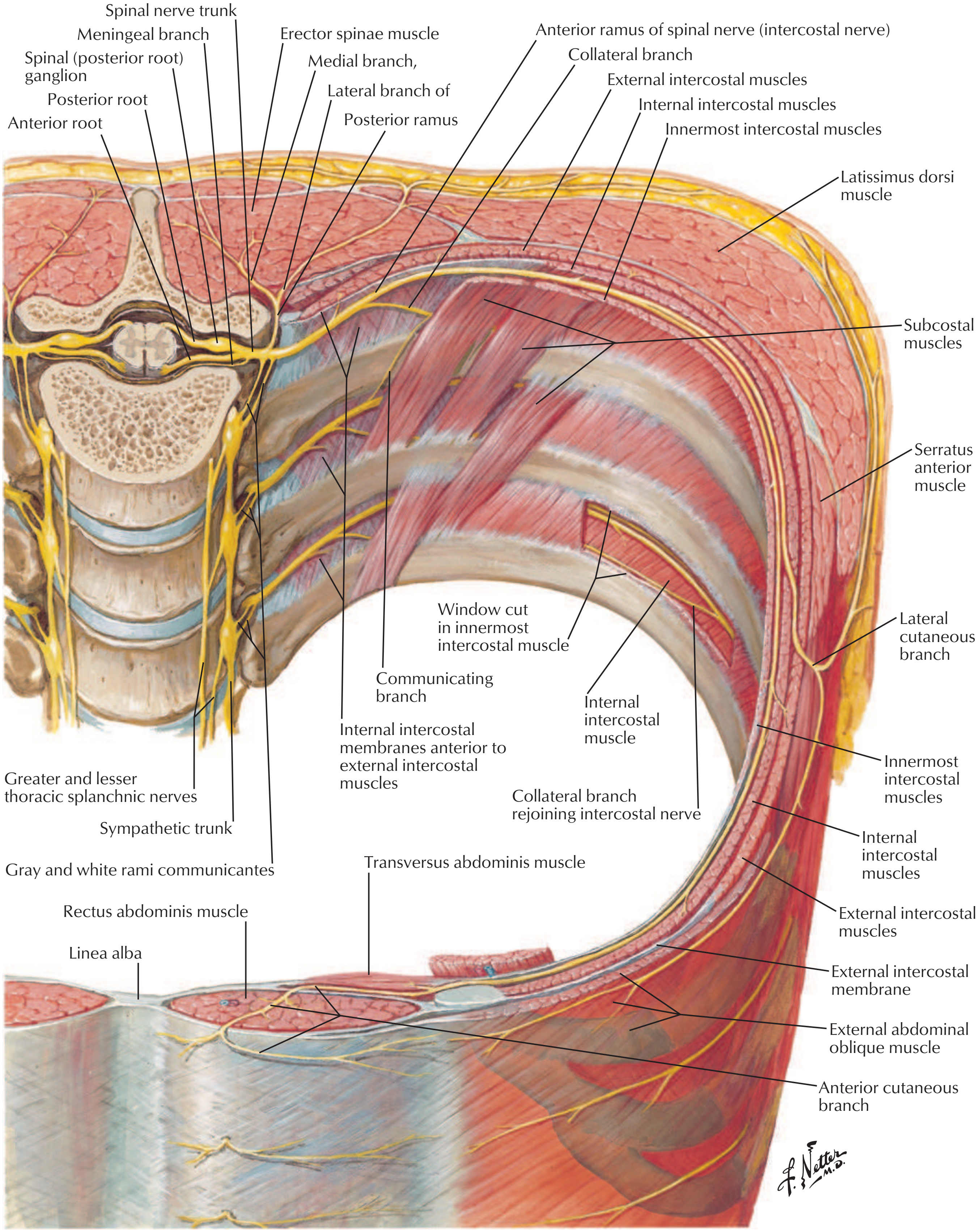
4
5
6
7
8
9
10
11
2
3
4
5
6
7
8
9
10
11
Medial brachial cutaneous nerve
Intercostobrachial nerve (T2)
Long thoracic nerve
Latissimus dorsi muscle
Lateral cutaneous branches of intercostal nerve (T2–11)
Anterior cutaneous branches of intercostal nerve (T1–11)
Lateral cutaneous branch of subcostal nerve (T12)
Lateral cutaneous branch of iliohypogastric nerve (L1)
Anterior cutaneous branch of subcostal nerve (T12)
Lateral femoral cutaneous nerve (L2, 3)
Anterior cutaneous branch of iliohypogastric nerve (L1)
Femoral branches of genitofemoral nerve (L1, 2)
Anterior scrotal branch of ilioinguinal nerve (L1)
Genital branch of genitofemoral nerve (L1, 2)
Serratus anterior muscle
External abdominal oblique muscle (*cut*)
Posterior layer of rectus sheath
Anterior layer of rectus sheath (*cut*)
Rectus abdominis muscle
Transversus abdominis muscle
Internal abdominal oblique muscle and aponeurosis (*cut*)
Anterior and lateral cutaneous branches of subcostal nerve (T12)
Ilioinguinal nerve (L1)
External abdominal oblique aponeurosis (*cut*)
Ilioinguinal nerve (L1)
Anterior cutaneous branch of iliohypogastric nerve (L1)
Cremaster muscle
External spermatic fascia


Spinal nerve trunk
Meningeal branch
Spinal (posterior root) ganglion
Posterior root
Anterior root
Erector spinae muscle
Medial branch,
Lateral branch of
Posterior ramus
Anterior ramus of spinal nerve (intercostal nerve)
Collateral branch
External intercostal muscles
Internal intercostal muscles
Innermost intercostal muscles
Latissimus dorsi muscle
Subcostal muscles
Serratus anterior muscle
Lateral cutaneous branch
Window cut in innermost intercostal muscle
Communicating branch
Internal intercostal membranes anterior to external intercostal muscles
Internal intercostal muscle
Collateral branch rejoining intercostal nerve
Innermost intercostal muscles
Internal intercostal muscles
External intercostal muscles
External intercostal membrane
External abdominal oblique muscle
Anterior cutaneous branch
Greater and lesser thoracic splanchnic nerves
Sympathetic trunk
Gray and white rami communicantes
Transversus abdominis muscle
Rectus abdominis muscle
Linea alba
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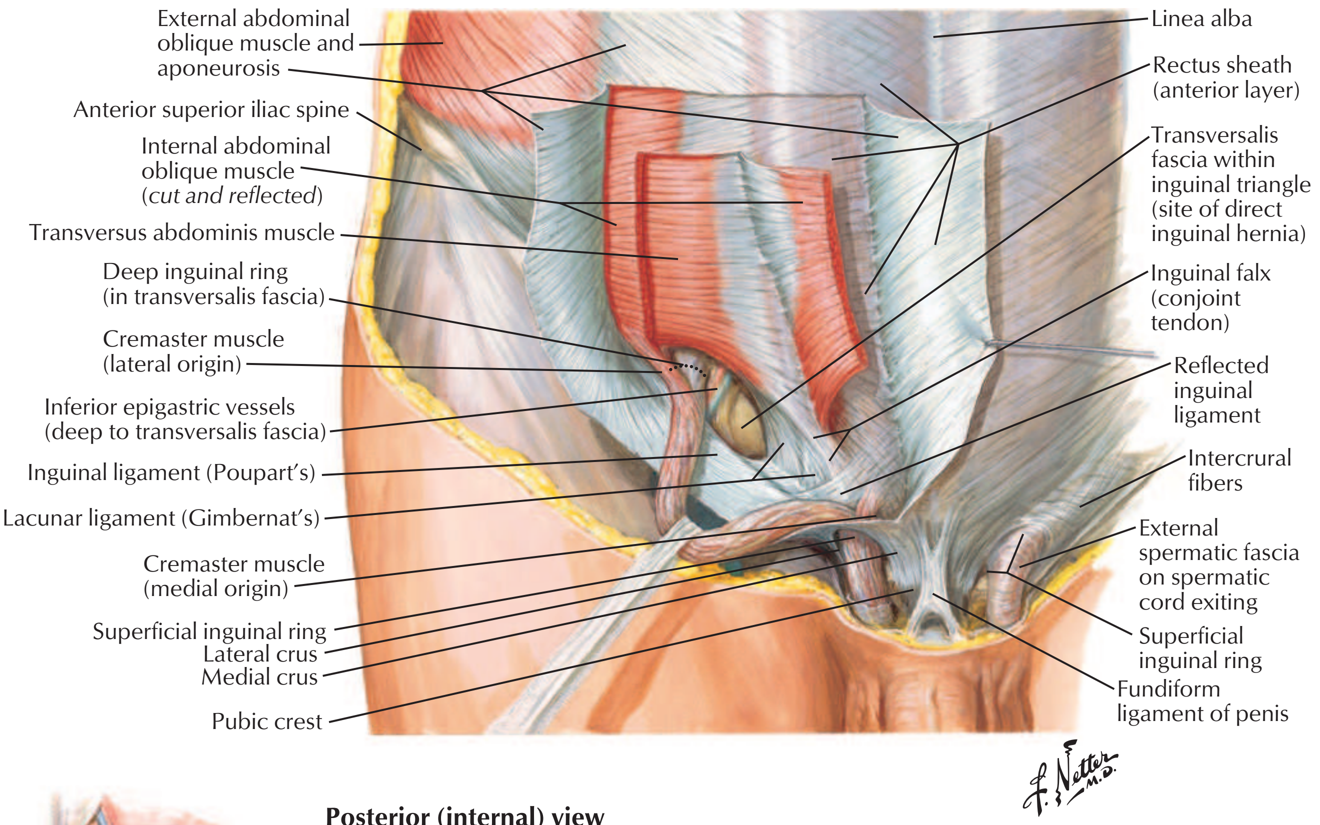
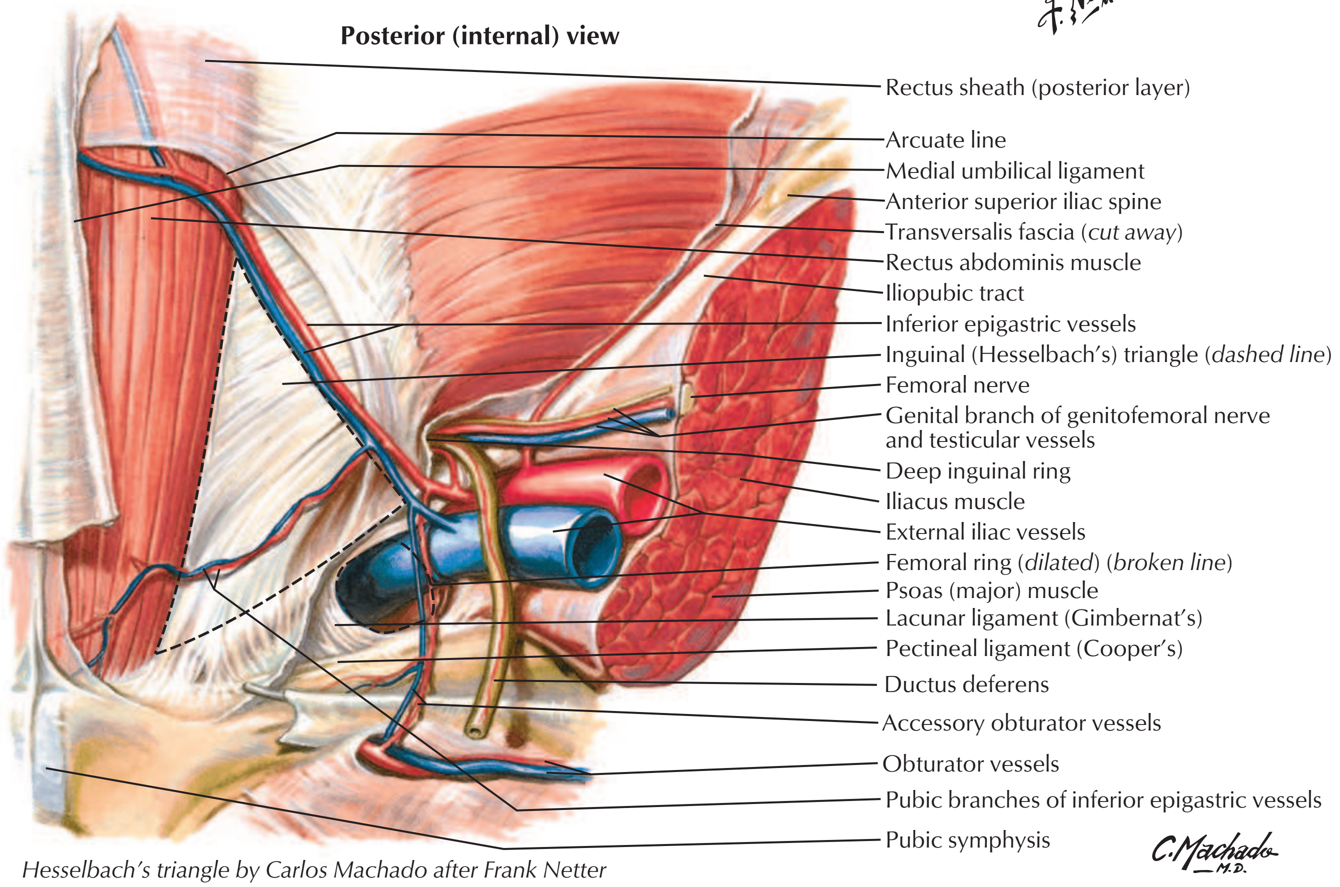
Inguinal Region: Dissections

See also Plates 254, 256

Anterior view

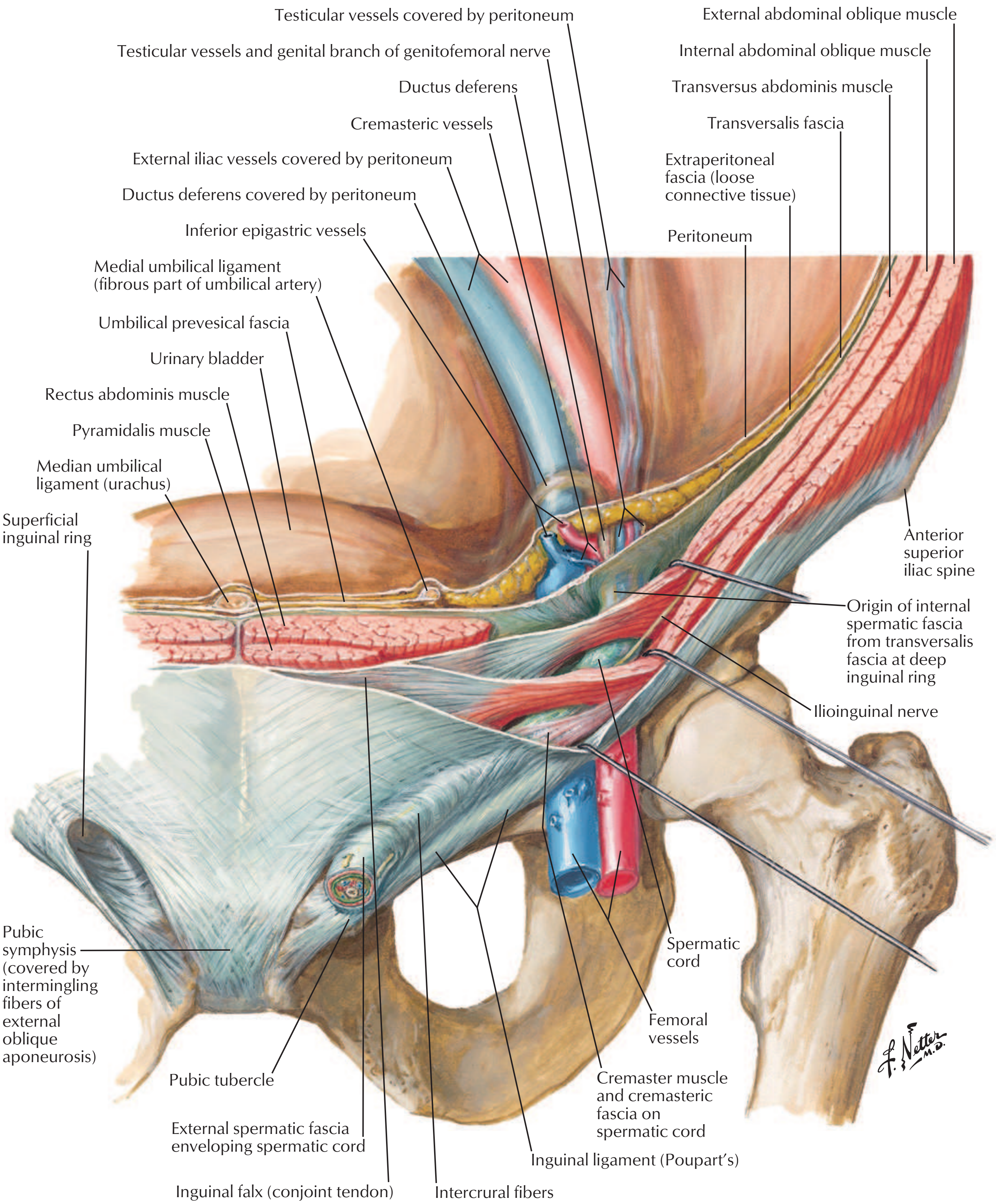

External abdominal oblique muscle and aponeurosis
Anterior superior iliac spine
Internal abdominal oblique muscle (*cut and reflected*)
Transversus abdominis muscle
Deep inguinal ring (in transversalis fascia)
Cremaster muscle (lateral origin)
Inferior epigastric vessels (deep to transversalis fascia)
Inguinal ligament (Poupart's)
Lacunar ligament (Gimbernat's)
Cremaster muscle (medial origin)
Superficial inguinal ring
Lateral crus
Medial crus
Pubic crest
Linea alba
Rectus sheath (anterior layer)
Transversalis fascia within inguinal triangle (site of direct inguinal hernia)
Inguinal falx (conjoint tendon)
Reflected inguinal ligament
Intercrural fibers
External spermatic fascia on spermatic cord exiting
Superficial inguinal ring
Fundiform ligament of penis
F. Netter M.D.

Posterior (internal) view


Rectus sheath (posterior layer)
Arcuate line
Medial umbilical ligament
Anterior superior iliac spine
Transversalis fascia (*cut away*)
Rectus abdominis muscle
Iliopubic tract
Inferior epigastric vessels
Inguinal (Hesselbach's) triangle (*dashed line*)
Femoral nerve
Genital branch of genitofemoral nerve and testicular vessels
Deep inguinal ring
Iliacus muscle
External iliac vessels
Femoral ring (*dilated*) (*broken line*)
Psoas (major) muscle
Lacunar ligament (Gimbernat's)
Pectineal ligament (Cooper's)
Ductus deferens
Accessory obturator vessels
Obturator vessels
Pubic branches of inferior epigastric vessels
Pubic symphysis
C. Machado M.D.

Hesselbach's triangle by Carlos Machado after Frank Netter

See also Plates 252, 260


Testicular vessels covered by peritoneum
Testicular vessels and genital branch of genitofemoral nerve
Ductus deferens
Cremasteric vessels
External iliac vessels covered by peritoneum
Ductus deferens covered by peritoneum
Inferior epigastric vessels
Medial umbilical ligament (fibrous part of umbilical artery)
Umbilical prevesical fascia
Urinary bladder
Rectus abdominis muscle
Pyramidalis muscle
Median umbilical ligament (urachus)
Superficial inguinal ring
External abdominal oblique muscle
Internal abdominal oblique muscle
Transversus abdominis muscle
Transversalis fascia
Extraperitoneal fascia (loose connective tissue)
Peritoneum
Anterior superior iliac spine
Origin of internal spermatic fascia from transversalis fascia at deep inguinal ring
Ilioinguinal nerve
Spermatic cord
Femoral vessels
Cremaster muscle and cremasteric fascia on spermatic cord
Inguinal ligament (Poupart's)
Intercrural fibers
Inguinal falx (conjoint tendon)
External spermatic fascia enveloping spermatic cord
Pubic tubercle
Pubic symphysis (covered by intermingling fibers of external oblique aponeurosis)
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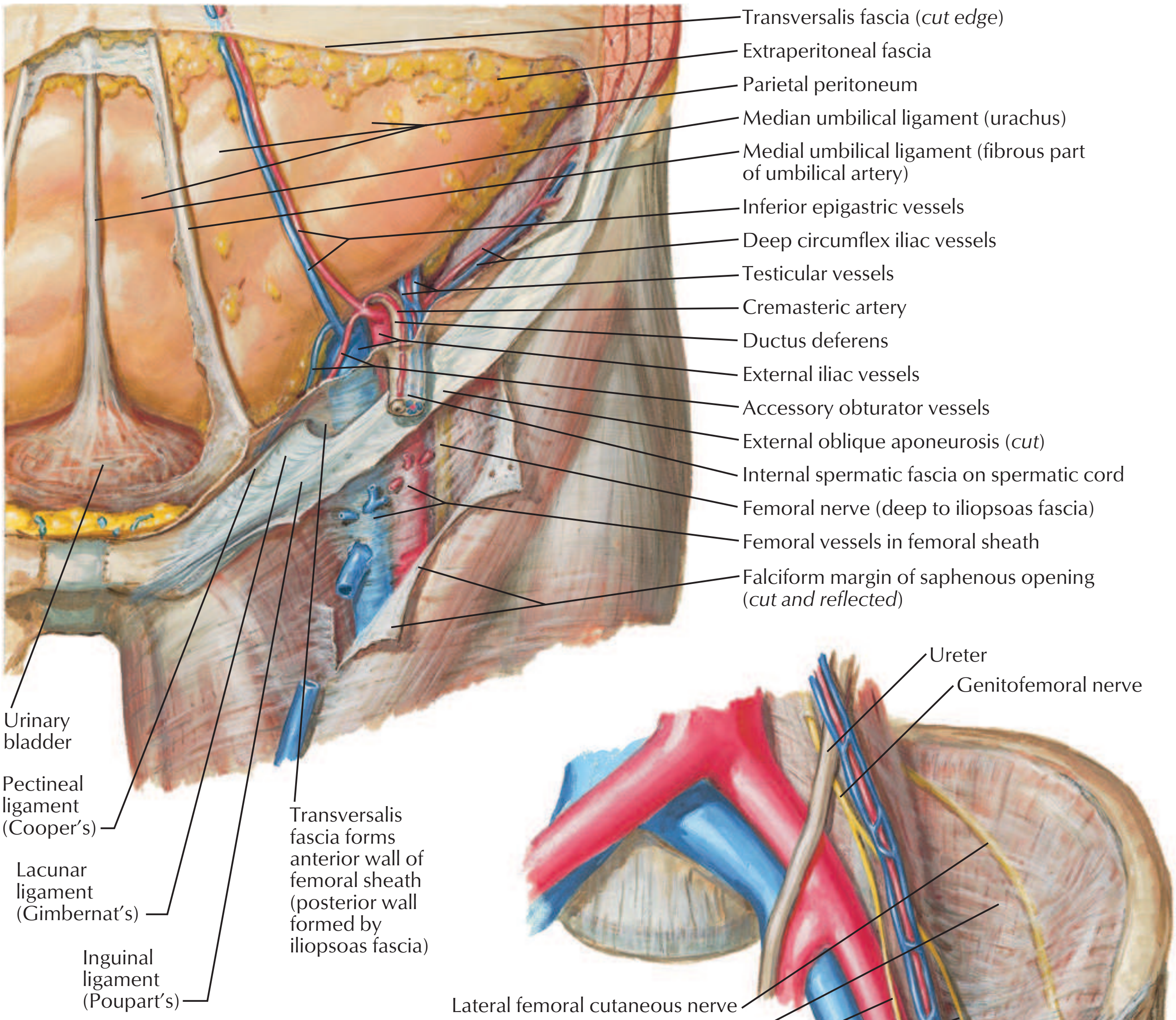
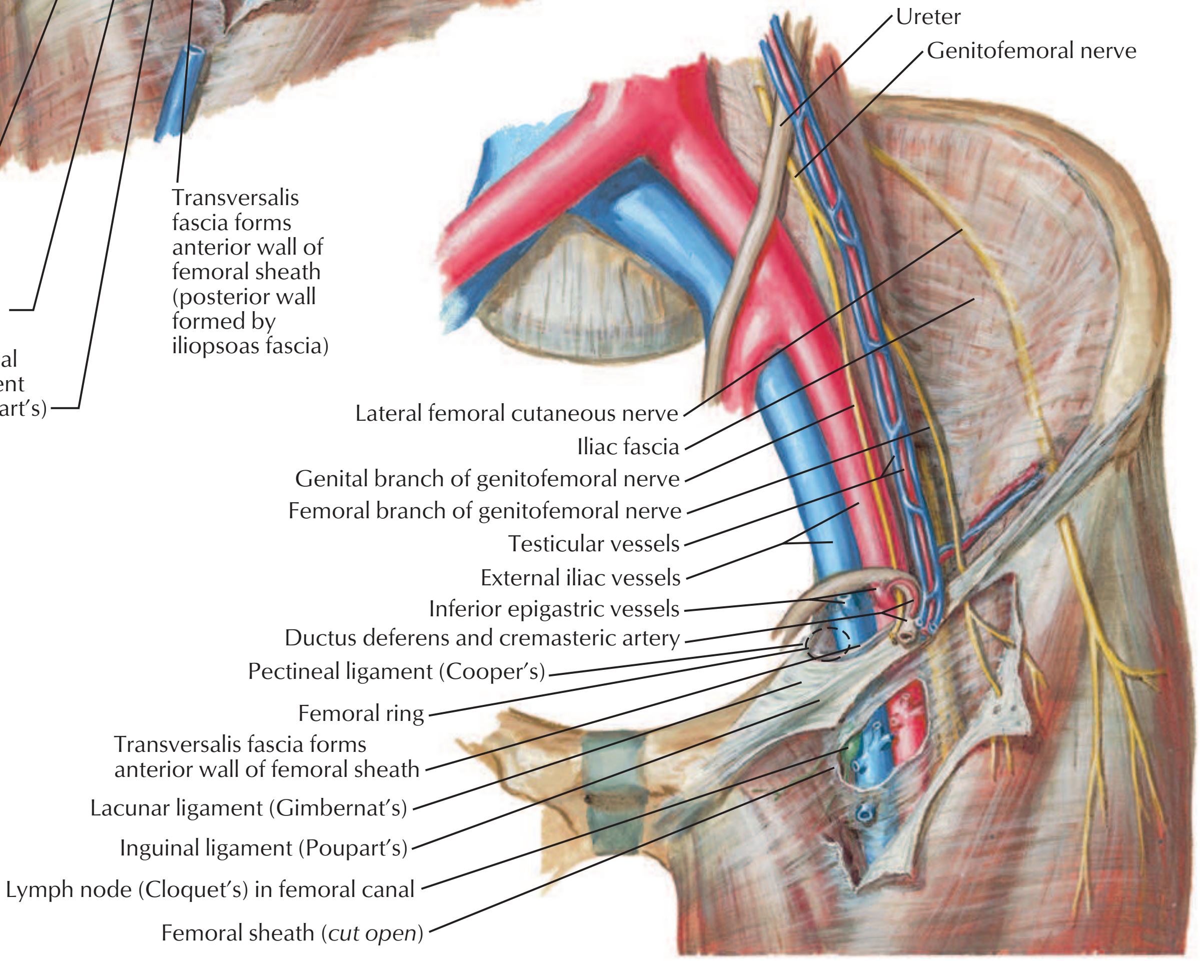
Femoral Sheath and Inguinal Canal

See also Plates 253, 254, 256


Transversalis fascia (*cut edge*)
Extraperitoneal fascia
Parietal peritoneum
Median umbilical ligament (urachus)
Medial umbilical ligament (fibrous part of umbilical artery)
Inferior epigastric vessels
Deep circumflex iliac vessels
Testicular vessels
Cremasteric artery
Ductus deferens
External iliac vessels
Accessory obturator vessels
External oblique aponeurosis (*cut*)
Internal spermatic fascia on spermatic cord
Femoral nerve (deep to iliopsoas fascia)
Femoral vessels in femoral sheath
Falciform margin of saphenous opening (*cut and reflected*)
Urinary bladder
Pectineal ligament (Cooper's)
Lacunar ligament (Gimbernat's)
Inguinal ligament (Poupart's)
Transversalis fascia forms anterior wall of femoral sheath (posterior wall formed by iliopsoas fascia)


Ureter
Genitofemoral nerve
Lateral femoral cutaneous nerve
Iliac fascia
Genital branch of genitofemoral nerve
Femoral branch of genitofemoral nerve
Testicular vessels
External iliac vessels
Inferior epigastric vessels
Ductus deferens and cremasteric artery
Pectineal ligament (Cooper's)
Femoral ring
Transversalis fascia forms anterior wall of femoral sheath
Lacunar ligament (Gimbernat's)
Inguinal ligament (Poupart's)
Lymph node (Cloquet's) in femoral canal
Femoral sheath (*cut open*)

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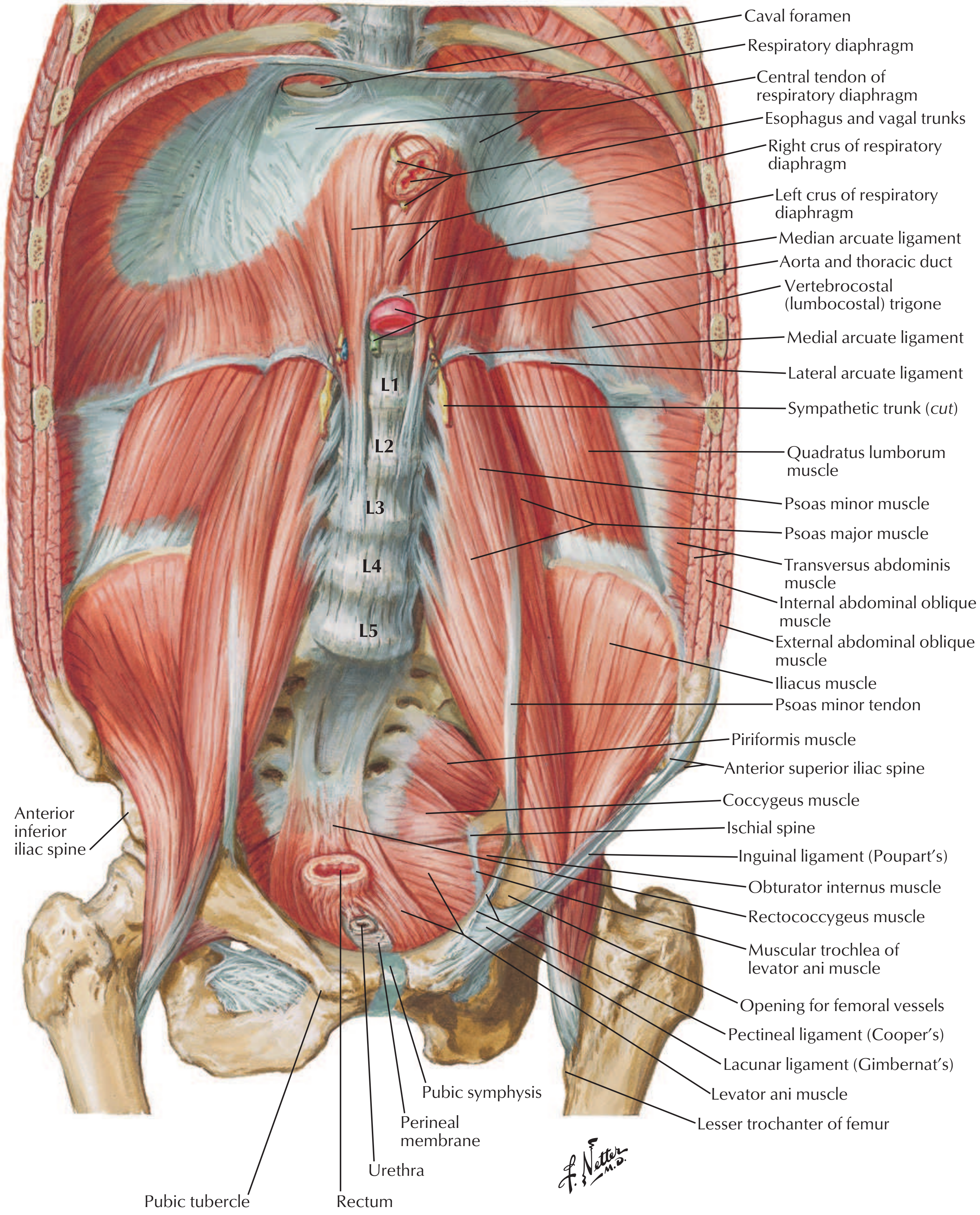
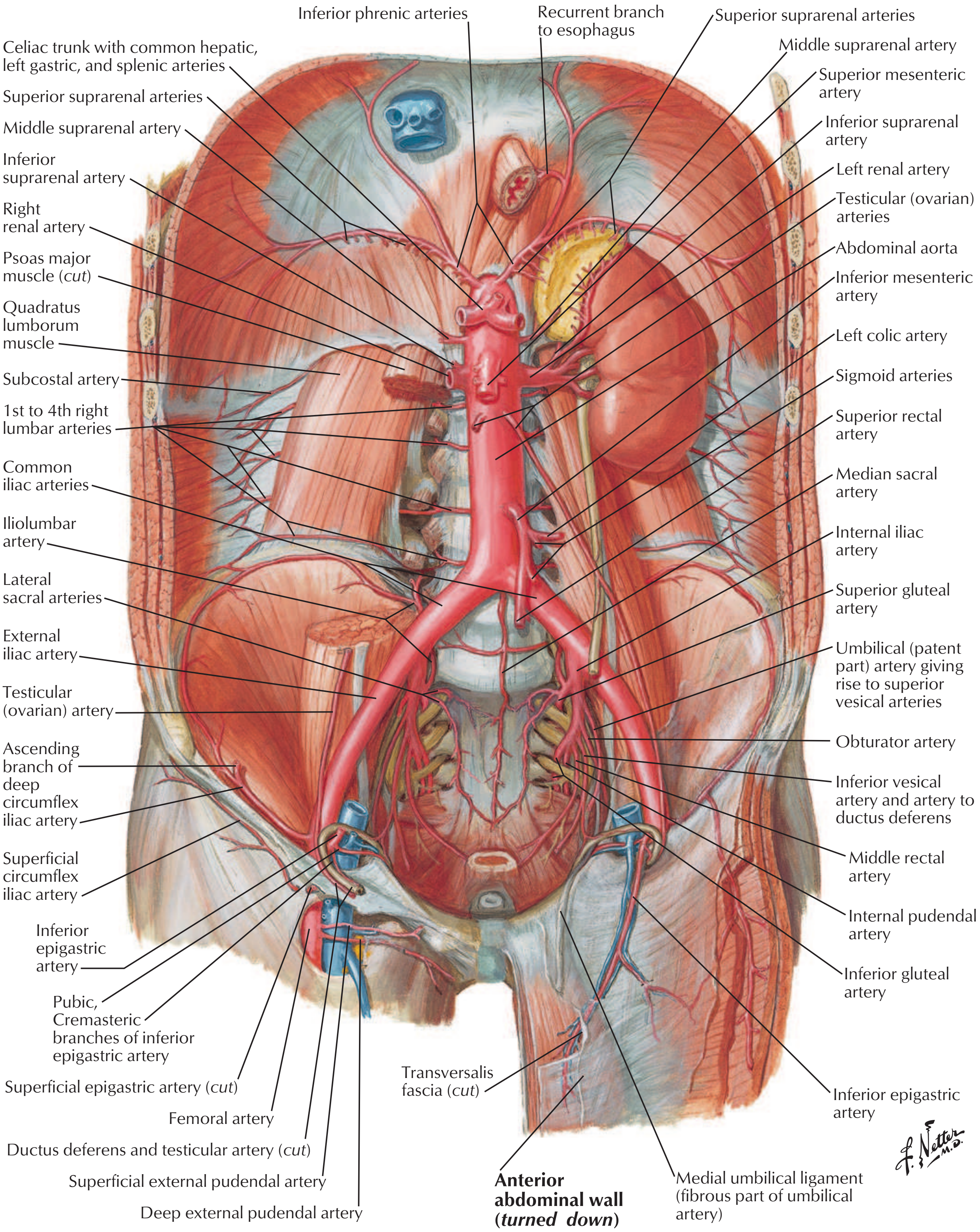
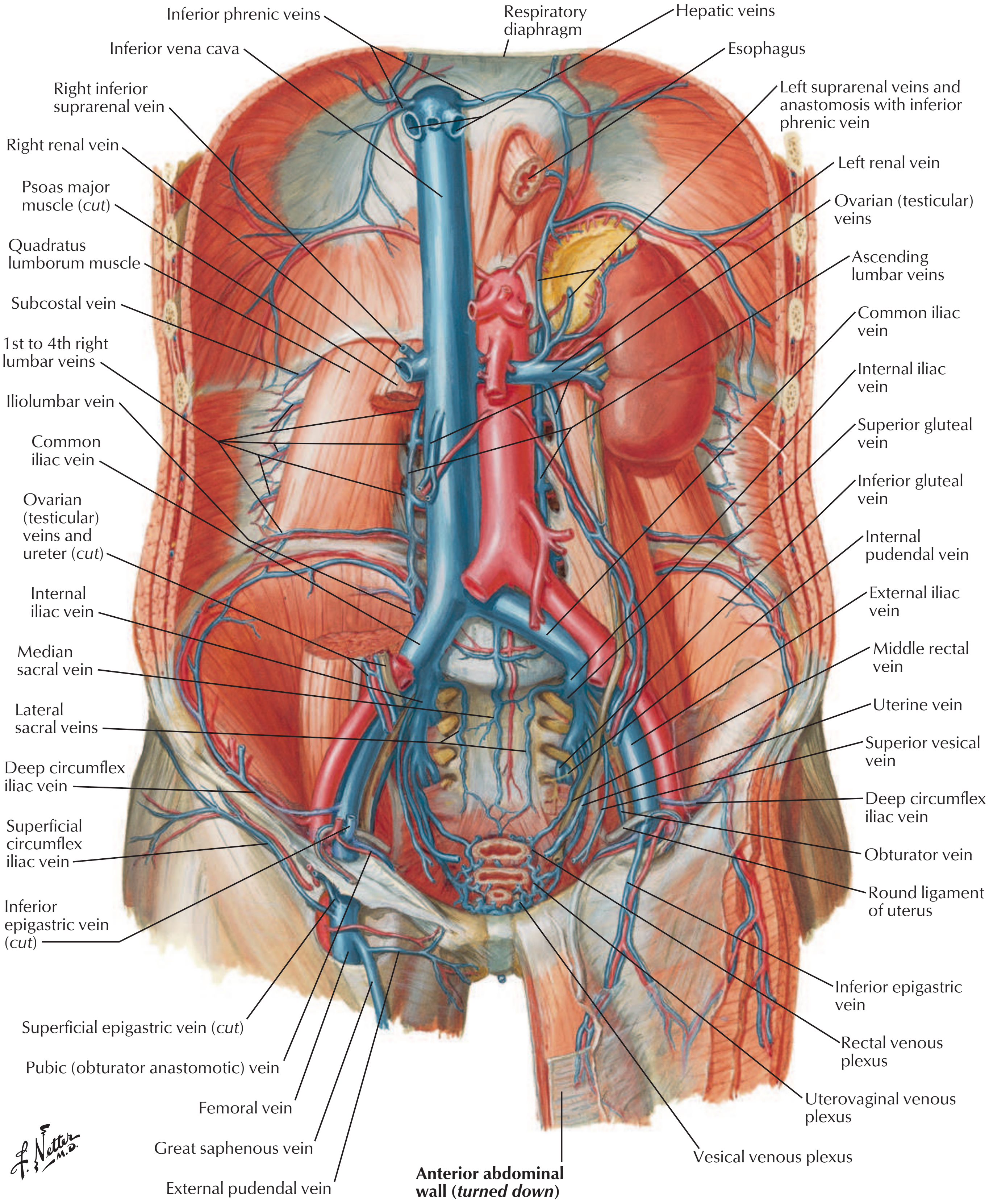

Caval foramen
Respiratory diaphragm
Central tendon of respiratory diaphragm
Esophagus and vagal trunks
Right crus of respiratory diaphragm
Left crus of respiratory diaphragm
Median arcuate ligament
Aorta and thoracic duct
Vertebrocostal (lumbocostal) trigone
Medial arcuate ligament
Lateral arcuate ligament
Sympathetic trunk (cut)
Quadratus lumborum muscle
Psoas minor muscle
Psoas major muscle
Transversus abdominis muscle
Internal abdominal oblique muscle
External abdominal oblique muscle
Iliacus muscle
Psoas minor tendon
Piriformis muscle
Anterior superior iliac spine
Coccygeus muscle
Ischial spine
Inguinal ligament (Poupart's)
Obturator internus muscle
Rectococcygeus muscle
Muscular trochlea of levator ani muscle
Opening for femoral vessels
Pectineal ligament (Cooper's)
Lacunar ligament (Gimbernat's)
Levator ani muscle
Lesser trochanter of femur
L1
L2
L3
L4
L5
Anterior inferior iliac spine
Pubic symphysis
Perineal membrane
Urethra
Pubic tubercle
Rectum
F. Netter M.D.

Arteries of Posterior Abdominal Wall

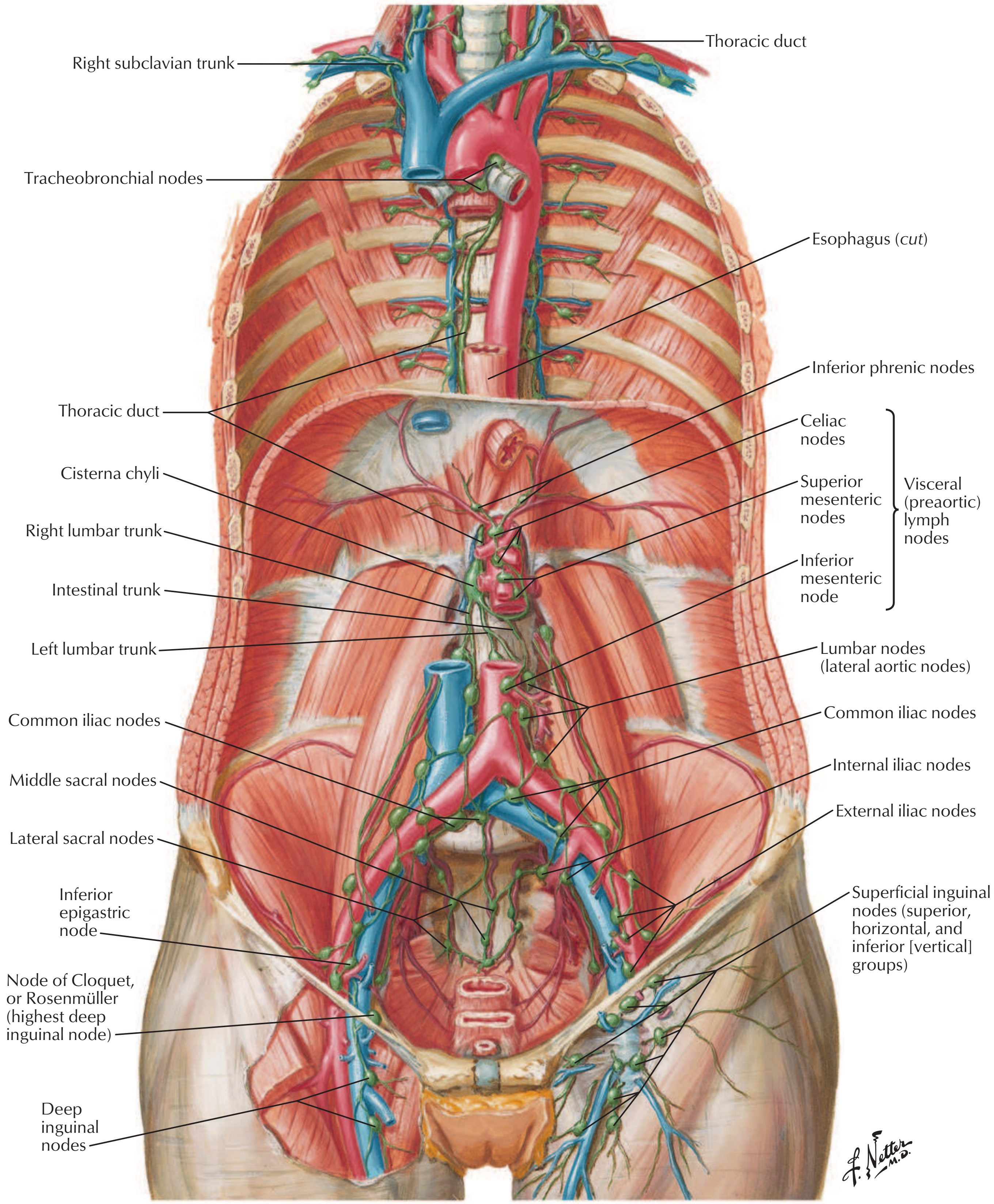
See also Plates 201, 383, 384


Inferior phrenic arteries
Recurrent branch to esophagus
Superior suprarenal arteries
Middle suprarenal artery
Superior mesenteric artery
Inferior suprarenal artery
Left renal artery
Testicular (ovarian) arteries
Abdominal aorta
Inferior mesenteric artery
Left colic artery
Sigmoid arteries
Superior rectal artery
Median sacral artery
Internal iliac artery
Superior gluteal artery
Umbilical (patent part) artery giving rise to superior vesical arteries
Obturator artery
Inferior vesical artery and artery to ductus deferens
Middle rectal artery
Internal pudendal artery
Inferior gluteal artery
Inferior epigastric artery
Celiac trunk with common hepatic, left gastric, and splenic arteries
Superior suprarenal arteries
Middle suprarenal artery
Inferior suprarenal artery
Right renal artery
Psoas major muscle (*cut*)
Quadratus lumborum muscle
Subcostal artery
1st to 4th right lumbar arteries
Common iliac arteries
Iliolumbar artery
Lateral sacral arteries
External iliac artery
Testicular (ovarian) artery
Ascending branch of deep circumflex iliac artery
Superficial circumflex iliac artery
Inferior epigastric artery
Pubic, Cremasteric branches of inferior epigastric artery
Superficial epigastric artery (*cut*)
Femoral artery
Ductus deferens and testicular artery (*cut*)
Superficial external pudendal artery
Deep external pudendal artery
Transversalis fascia (*cut*)
Anterior abdominal wall (*turned down*)
Medial umbilical ligament (fibrous part of umbilical artery)
F. Netter M.D.

See also Plates 382, 383

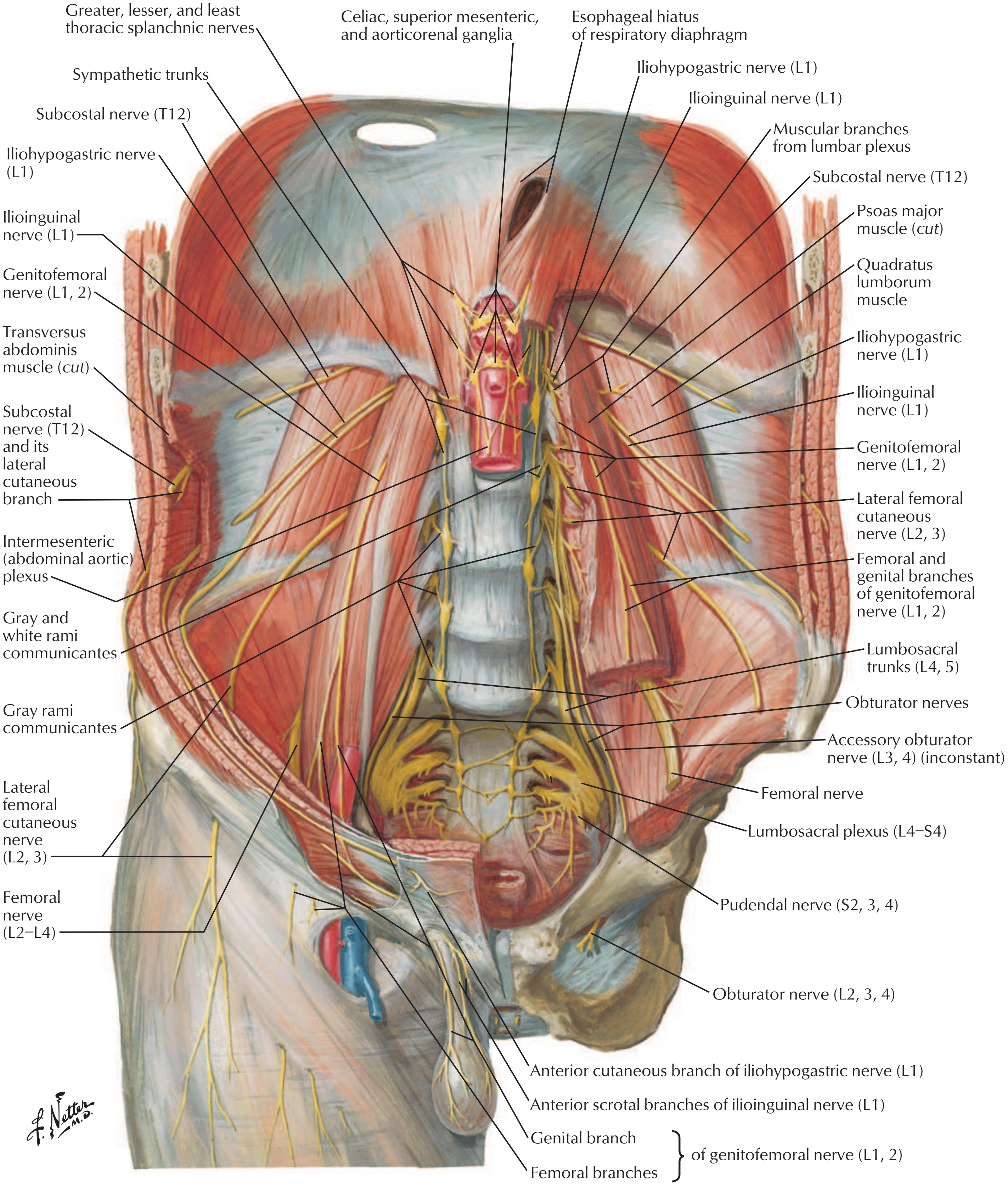

Inferior phrenic veins
Respiratory diaphragm
Hepatic veins
Inferior vena cava
Esophagus
Right inferior suprarenal vein
Left suprarenal veins and anastomosis with inferior phrenic vein
Right renal vein
Left renal vein
Psoas major muscle (*cut*)
Ovarian (testicular) veins
Quadratus lumborum muscle
Ascending lumbar veins
Subcostal vein
Common iliac vein
1st to 4th right lumbar veins
Internal iliac vein
Iliolumbar vein
Superior gluteal vein
Common iliac vein
Inferior gluteal vein
Ovarian (testicular) veins and ureter (*cut*)
Internal pudendal vein
Internal iliac vein
External iliac vein
Median sacral vein
Middle rectal vein
Lateral sacral veins
Uterine vein
Superior vesical vein
Deep circumflex iliac vein
Deep circumflex iliac vein
Superficial circumflex iliac vein
Obturator vein
Round ligament of uterus
Inferior epigastric vein (*cut*)
Inferior epigastric vein
Superficial epigastric vein (*cut*)
Rectal venous plexus
Pubic (obturator anastomotic) vein
Uterovaginal venous plexus
Femoral vein
Vesical venous plexus
Great saphenous vein
Anterior abdominal wall (*turned down*)
External pudendal vein
F. Netter M.D.

See also Plates 319, 388

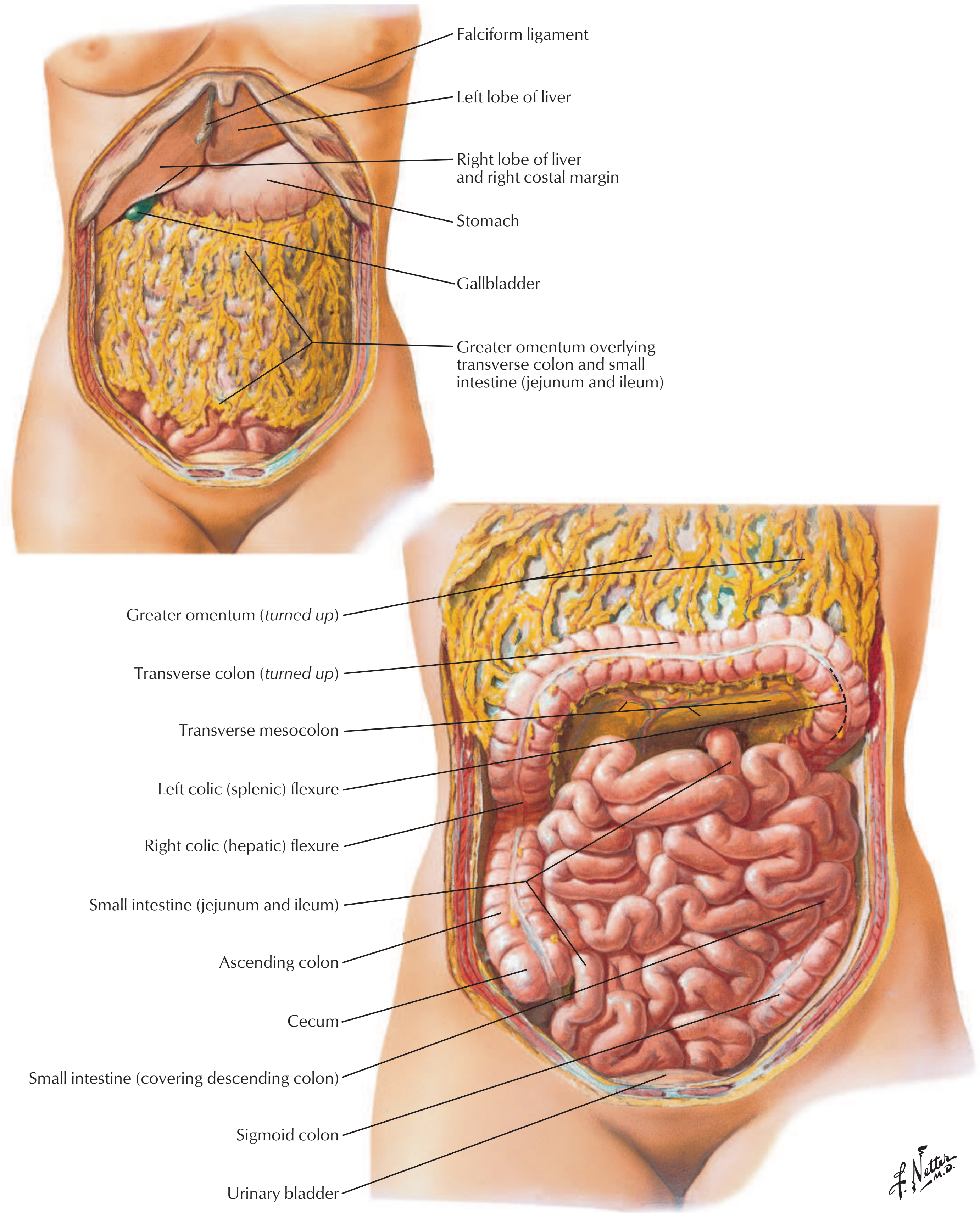

Thoracic duct
Right subclavian trunk
Tracheobronchial nodes
Esophagus (*cut*)
Inferior phrenic nodes
Thoracic duct
Celiac nodes
Cisterna chyli
Superior mesenteric nodes
Visceral (preaortic) lymph nodes
Right lumbar trunk
Inferior mesenteric node
Intestinal trunk
Left lumbar trunk
Lumbar nodes (lateral aortic nodes)
Common iliac nodes
Common iliac nodes
Internal iliac nodes
Middle sacral nodes
External iliac nodes
Lateral sacral nodes
Superficial inguinal nodes (superior, horizontal, and inferior [vertical] groups)
Inferior epigastric node
Node of Cloquet, or Rosenmüller (highest deep inguinal node)
Deep inguinal nodes
F. Netter M.D.

Nerves of Posterior Abdominal Wall

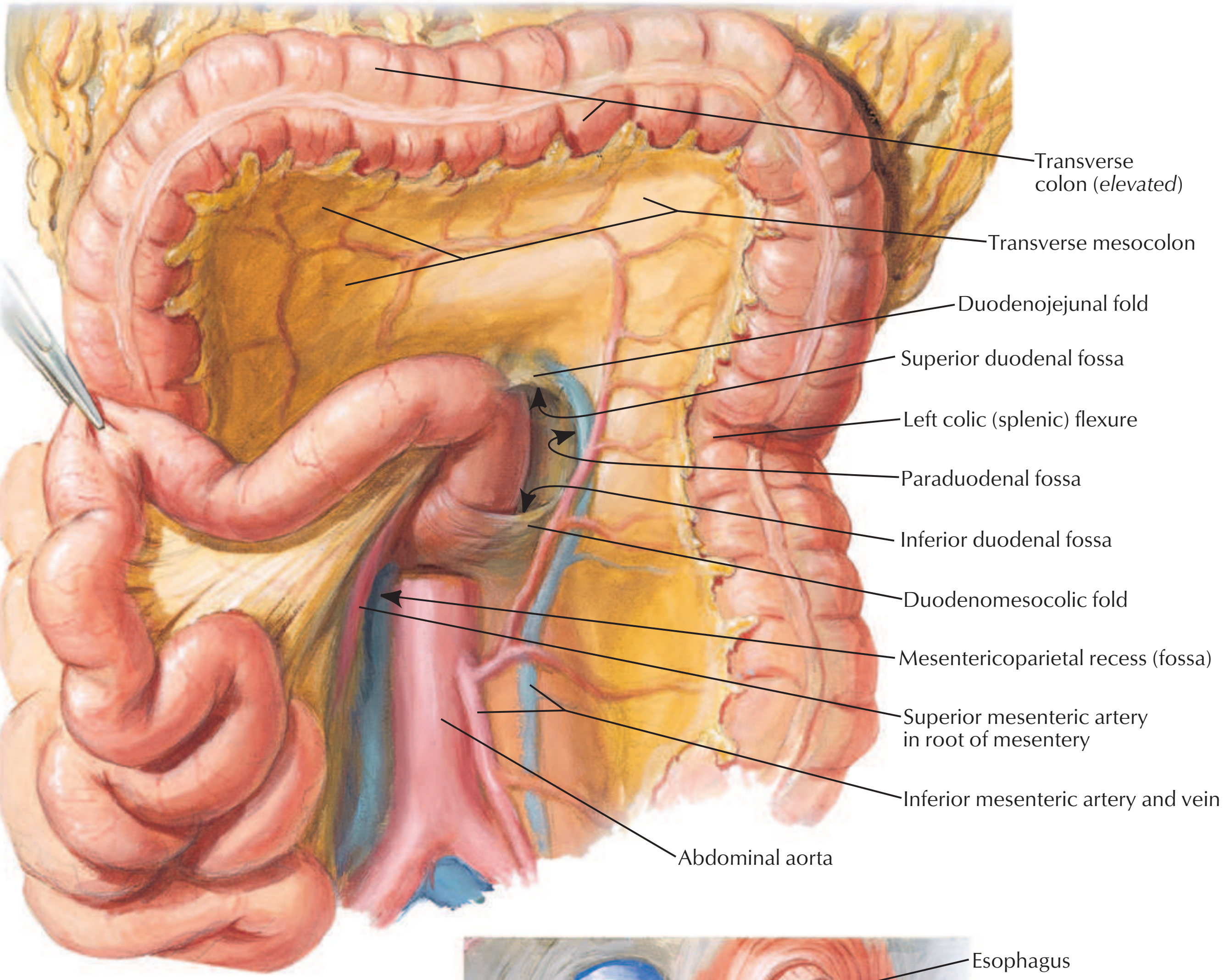
See also Plates 201, 392


Greater, lesser, and least thoracic splanchnic nerves
Celiac, superior mesenteric, and aorticorenal ganglia
Esophageal hiatus of respiratory diaphragm
Iliohypogastric nerve (L1)
Ilioinguinal nerve (L1)
Muscular branches from lumbar plexus
Subcostal nerve (T12)
Psoas major muscle (*cut*)
Quadratus lumborum muscle
Iliohypogastric nerve (L1)
Ilioinguinal nerve (L1)
Genitofemoral nerve (L1, 2)
Lateral femoral cutaneous nerve (L2, 3)
Femoral and genital branches of genitofemoral nerve (L1, 2)
Lumbosacral trunks (L4, 5)
Obturator nerves
Accessory obturator nerve (L3, 4) (inconstant)
Femoral nerve
Lumbosacral plexus (L4–S4)
Pudendal nerve (S2, 3, 4)
Obturator nerve (L2, 3, 4)
Anterior cutaneous branch of iliohypogastric nerve (L1)
Anterior scrotal branches of ilioinguinal nerve (L1)
Genital branch
Femoral branches
of genitofemoral nerve (L1, 2)
Sympathetic trunks
Subcostal nerve (T12)
Iliohypogastric nerve (L1)
Ilioinguinal nerve (L1)
Genitofemoral nerve (L1, 2)
Transversus abdominis muscle (*cut*)
Subcostal nerve (T12) and its lateral cutaneous branch
Intermesenteric (abdominal aortic) plexus
Gray and white rami communicantes
Gray rami communicantes
Lateral femoral cutaneous nerve (L2, 3)
Femoral nerve (L2–L4)
F. Netter M.D.

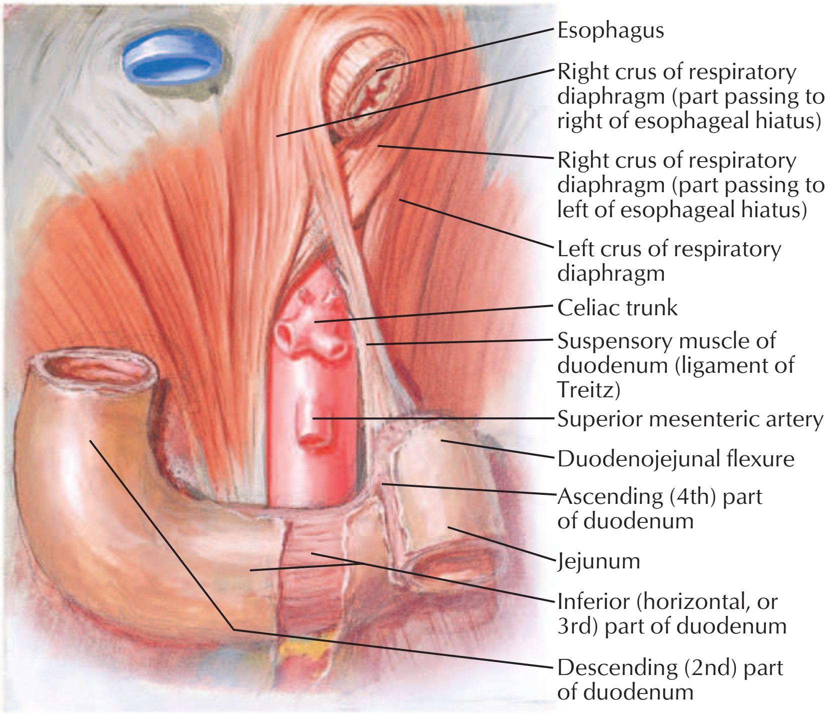
Greater Omentum and Abdominal Viscera


Falciform ligament
Left lobe of liver
Right lobe of liver and right costal margin
Stomach
Gallbladder
Greater omentum overlying transverse colon and small intestine (jejunum and ileum)
Greater omentum (*turned up*)
Transverse colon (*turned up*)
Transverse mesocolon
Left colic (splenic) flexure
Right colic (hepatic) flexure
Small intestine (jejunum and ileum)
Ascending colon
Cecum
Small intestine (covering descending colon)
Sigmoid colon
Urinary bladder

See also **Plate 288**

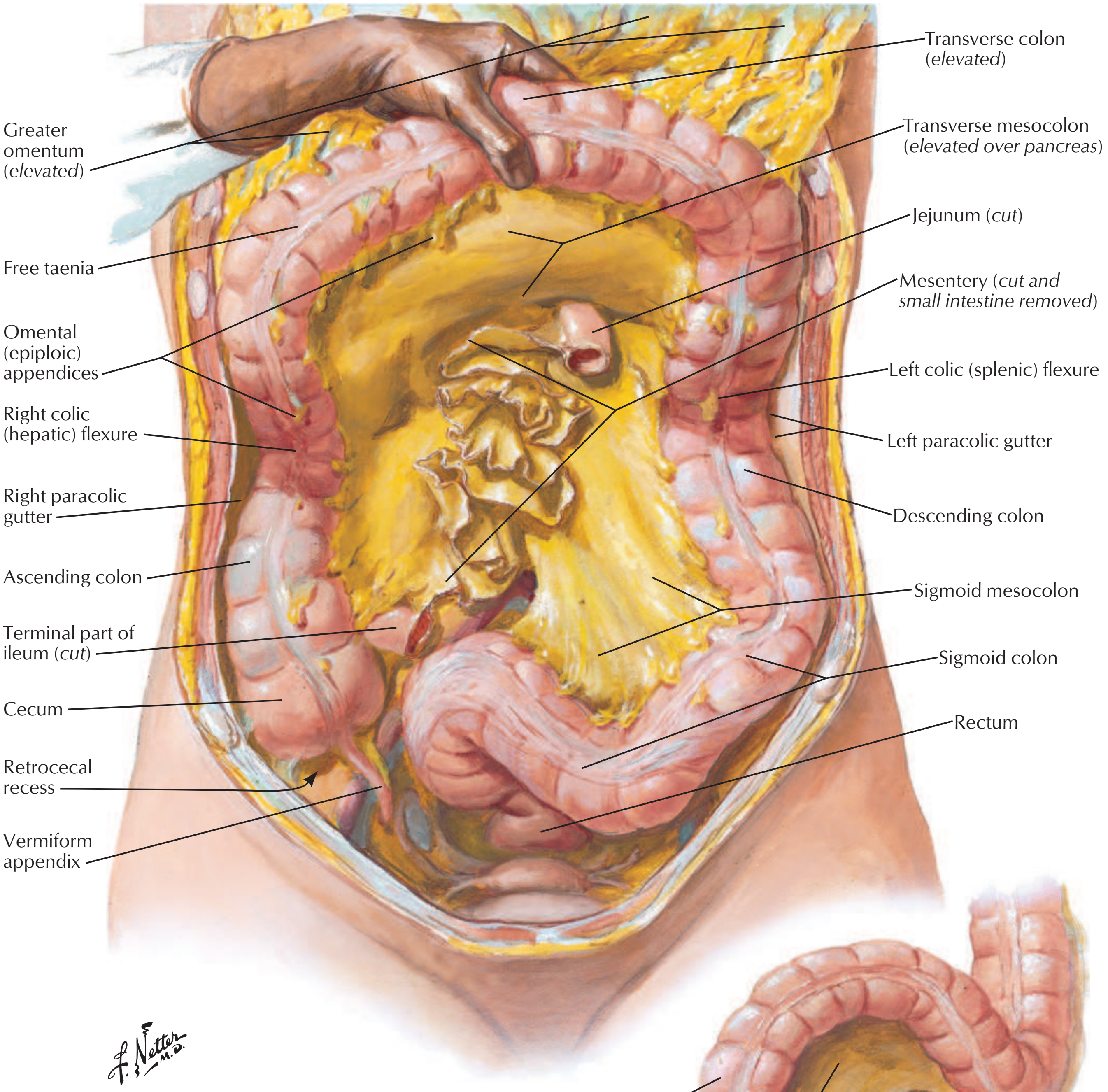

Transverse colon (*elevated*)
Transverse mesocolon
Duodenojejunal fold
Superior duodenal fossa
Left colic (splenic) flexure
Paraduodenal fossa
Inferior duodenal fossa
Duodenomesocolic fold
Mesentericoparietal recess (fossa)
Superior mesenteric artery in root of mesentery
Inferior mesenteric artery and vein
Abdominal aorta

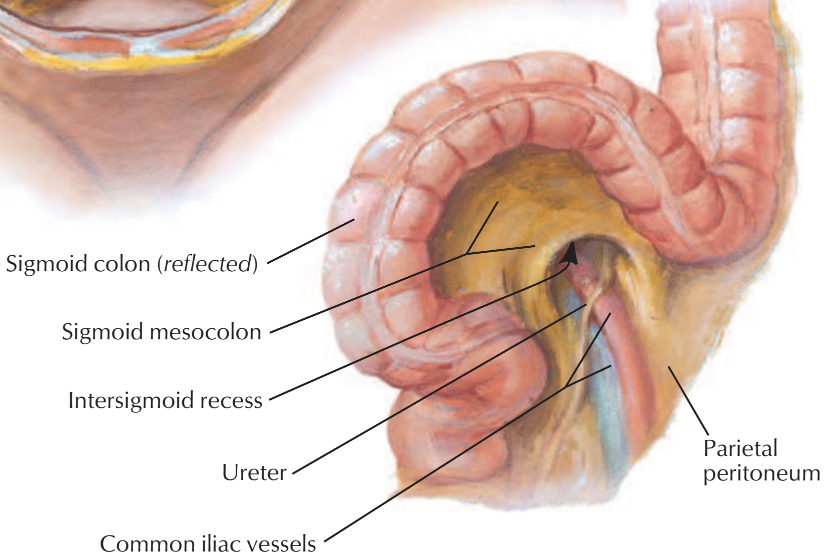
Exposure of suspensory muscle of duodenum (ligament of Treitz)


Esophagus
Right crus of respiratory diaphragm (part passing to right of esophageal hiatus)
Right crus of respiratory diaphragm (part passing to left of esophageal hiatus)
Left crus of respiratory diaphragm
Celiac trunk
Suspensory muscle of duodenum (ligament of Treitz)
Superior mesenteric artery
Duodenojejunal flexure
Ascending (4th) part of duodenum
Jejunum
Inferior (horizontal, or 3rd) part of duodenum
Descending (2nd) part of duodenum

F. Netter M.D.

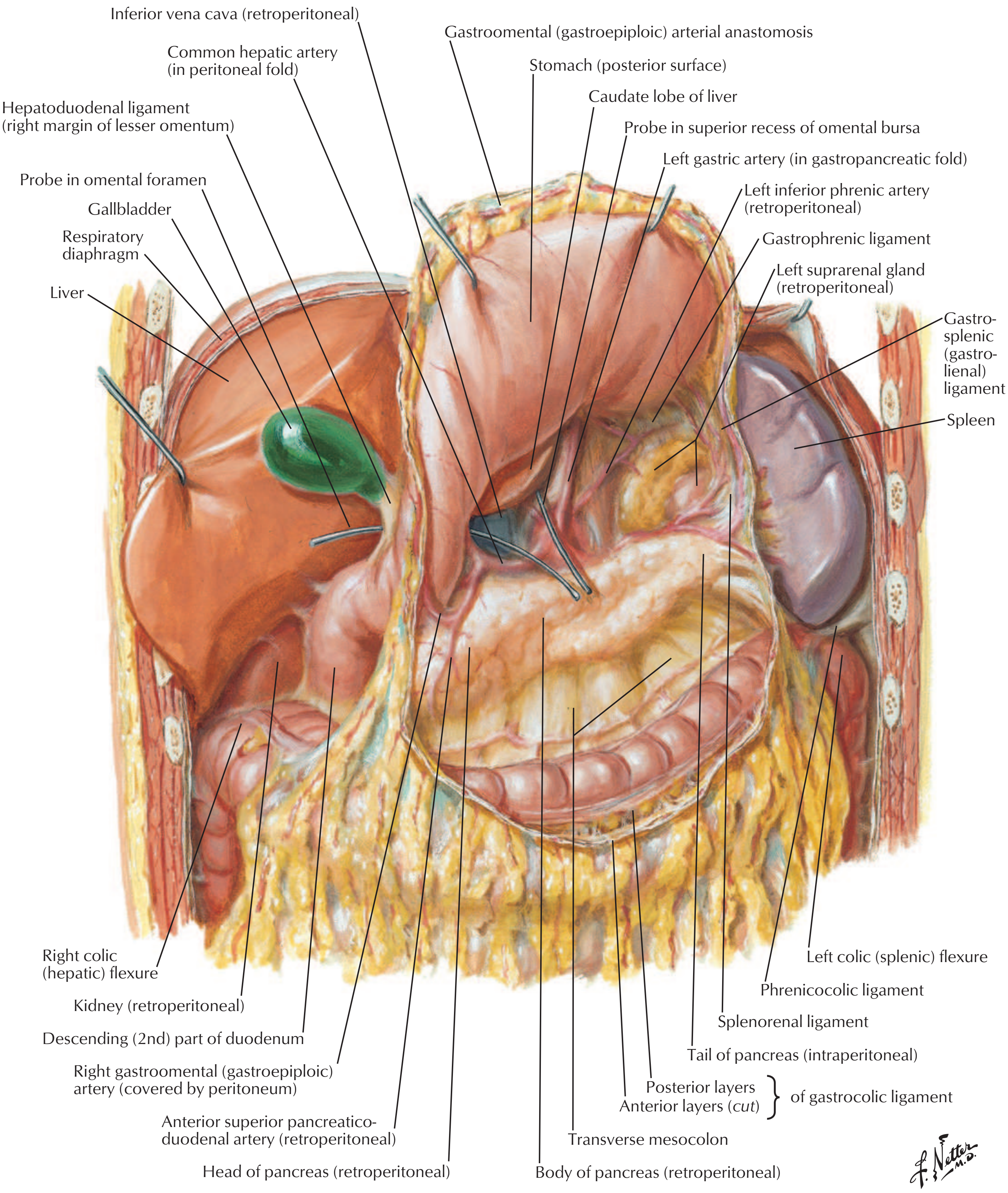
Mesenteric Relations of Intestines (continued)


Greater omentum (*elevated*)
Free taenia
Omental (epiploic) appendices
Right colic (hepatic) flexure
Right paracolic gutter
Ascending colon
Terminal part of ileum (*cut*)
Cecum
Retrocecal recess
Vermiform appendix
Transverse colon (*elevated*)
Transverse mesocolon (*elevated over pancreas*)
Jejunum (*cut*)
Mesentery (*cut and small intestine removed*)
Left colic (splenic) flexure
Left paracolic gutter
Descending colon
Sigmoid mesocolon
Sigmoid colon
Rectum
F. Netter M.D.


Sigmoid colon (*reflected*)
Sigmoid mesocolon
Intersigmoid recess
Ureter
Common iliac vessels
Parietal peritoneum

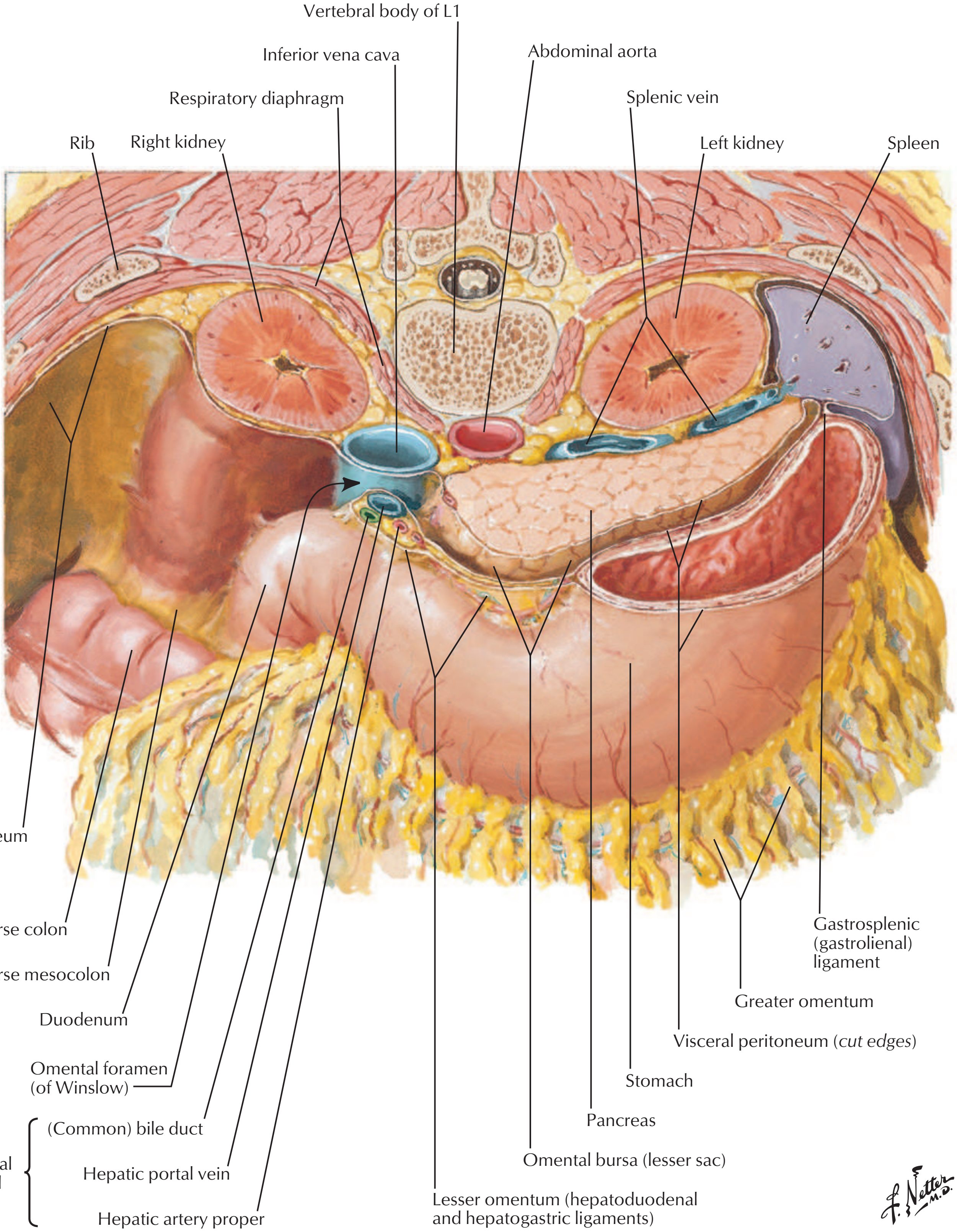
Omental Bursa: Stomach Reflected

See also Plates 288, 291


Inferior vena cava (retroperitoneal)
Common hepatic artery (in peritoneal fold)
Hepatoduodenal ligament (right margin of lesser omentum)
Probe in omental foramen
Gallbladder
Respiratory diaphragm
Liver
Gastroomental (gastroepiploic) arterial anastomosis
Stomach (posterior surface)
Caudate lobe of liver
Probe in superior recess of omental bursa
Left gastric artery (in gastropancreatic fold)
Left inferior phrenic artery (retroperitoneal)
Gastrophrenic ligament
Left suprarenal gland (retroperitoneal)
Gastrosplenic (gastrolienal) ligament
Spleen
Right colic (hepatic) flexure
Kidney (retroperitoneal)
Descending (2nd) part of duodenum
Right gastroomental (gastroepiploic) artery (covered by peritoneum)
Anterior superior pancreaticoduodenal artery (retroperitoneal)
Head of pancreas (retroperitoneal)
Left colic (splenic) flexure
Phrenicocolic ligament
Splenorenal ligament
Tail of pancreas (intraperitoneal)
Posterior layers
Anterior layers (cut)
of gastrocolic ligament
Transverse mesocolon
Body of pancreas (retroperitoneal)
F. Netter M.D.

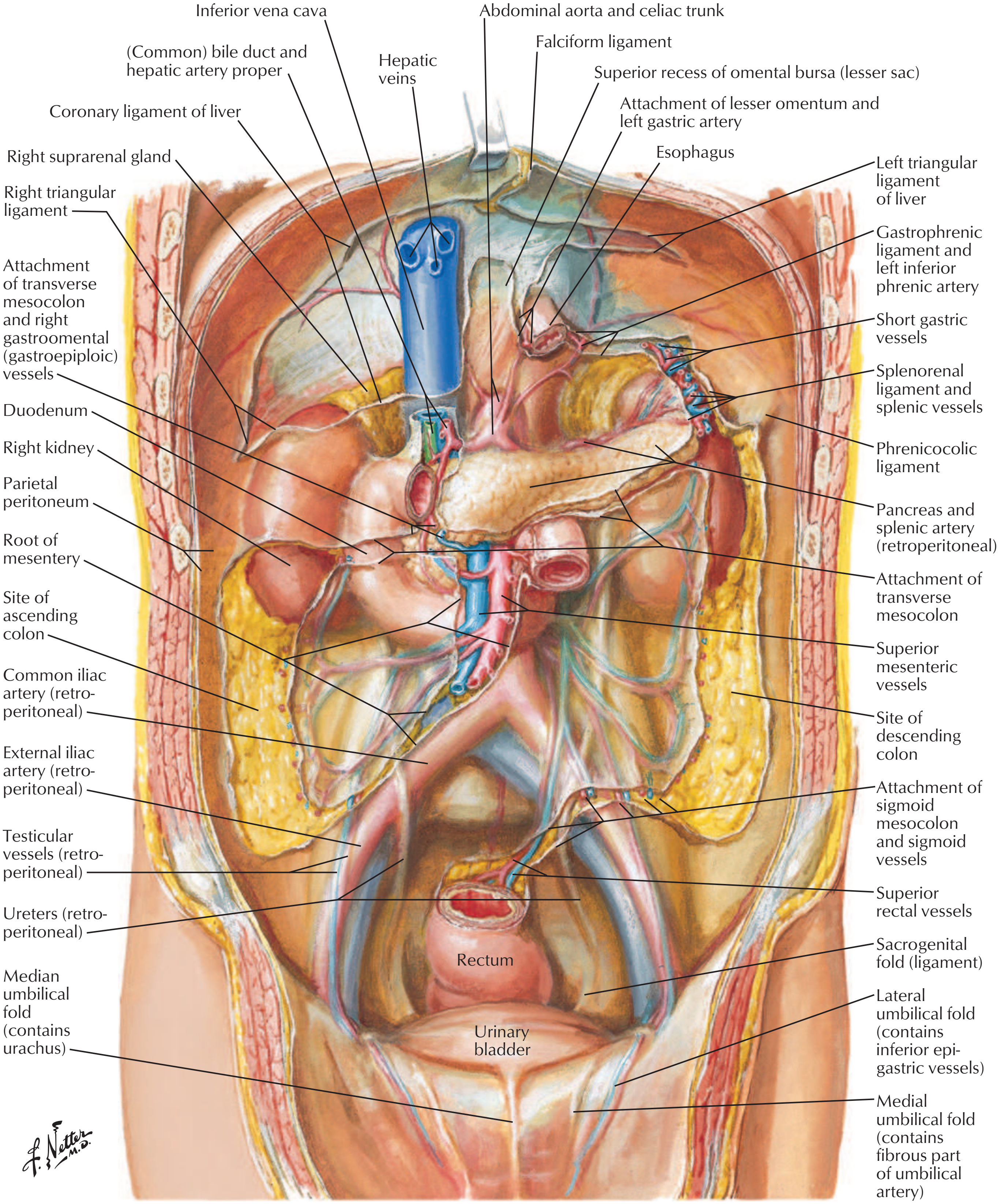
Omental Bursa: Cross Section

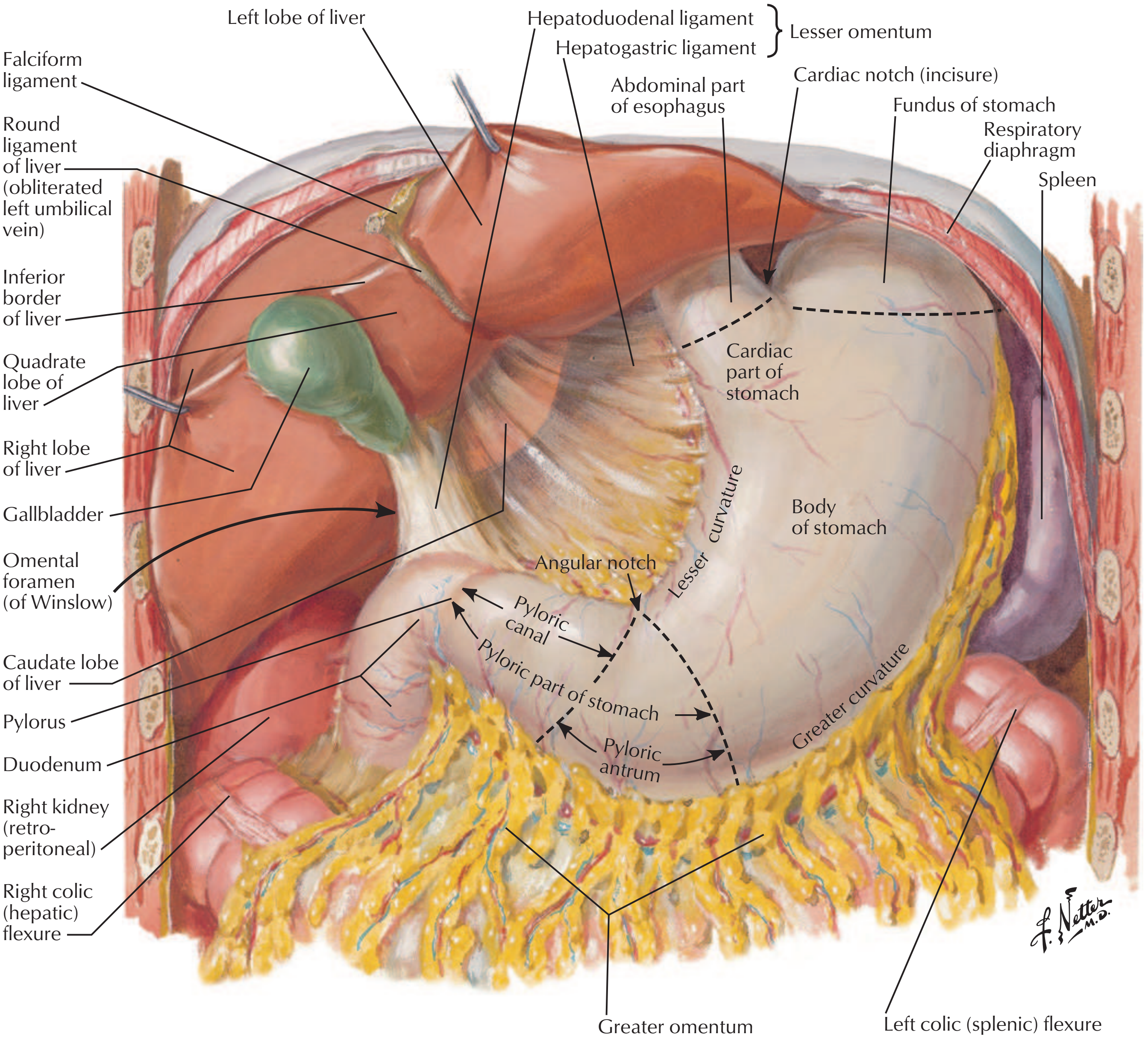
See also **Plate 276**


Vertebral body of L1
Inferior vena cava
Abdominal aorta
Respiratory diaphragm
Splenic vein
Rib
Right kidney
Left kidney
Spleen
Parietal peritoneum
Transverse colon
Transverse mesocolon
Duodenum
Omental foramen (of Winslow)
Portal triad
(Common) bile duct
Hepatic portal vein
Hepatic artery proper
Gastrosplenic (gastrolienal) ligament
Greater omentum
Visceral peritoneum (*cut edges*)
Stomach
Pancreas
Omental bursa (lesser sac)
Lesser omentum (hepatoduodenal and hepatogastric ligaments)
F. Netter M.D.

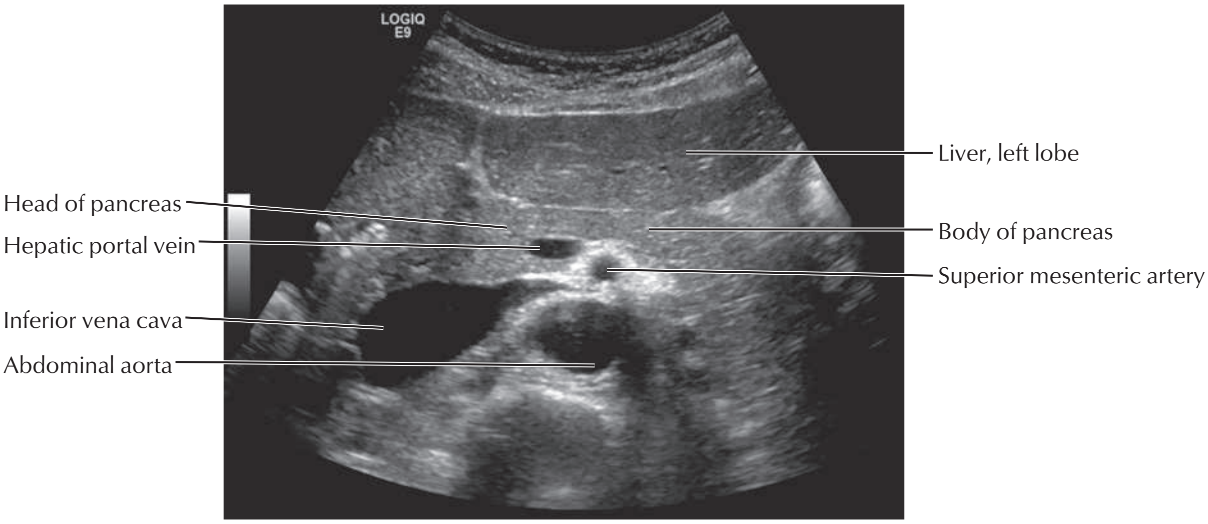
Peritoneum of Posterior Abdominal Wall

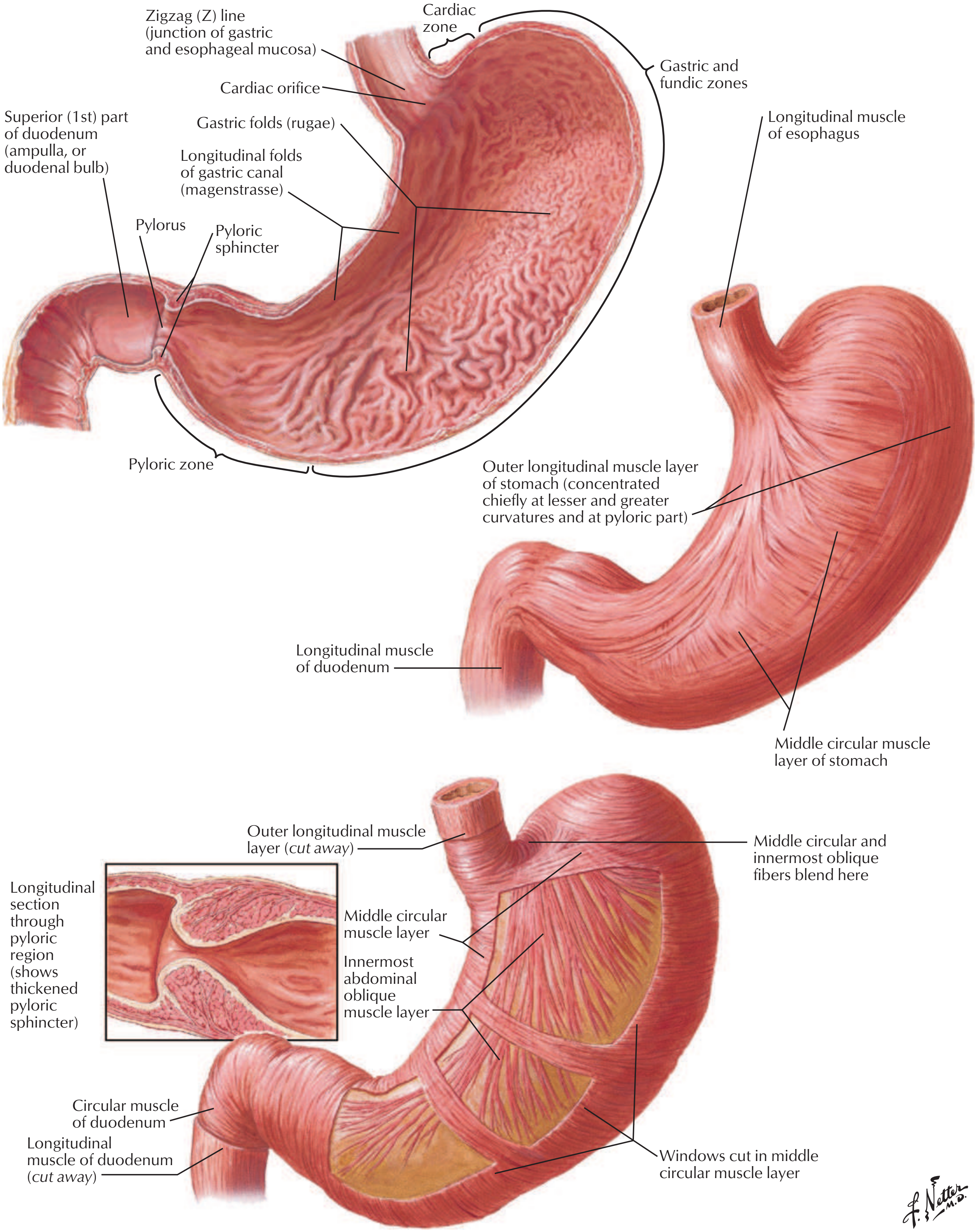
See also Plate 278


Inferior vena cava
Abdominal aorta and celiac trunk
(Common) bile duct and hepatic artery proper
Hepatic veins
Falciform ligament
Superior recess of omental bursa (lesser sac)
Coronary ligament of liver
Attachment of lesser omentum and left gastric artery
Right suprarenal gland
Esophagus
Right triangular ligament
Left triangular ligament of liver
Attachment of transverse mesocolon and right gastroomental (gastroepiploic) vessels
Gastrophrenic ligament and left inferior phrenic artery
Short gastric vessels
Duodenum
Splenorenal ligament and splenic vessels
Right kidney
Phrenicocolic ligament
Parietal peritoneum
Pancreas and splenic artery (retroperitoneal)
Root of mesentery
Attachment of transverse mesocolon
Site of ascending colon
Superior mesenteric vessels
Common iliac artery (retroperitoneal)
Site of descending colon
External iliac artery (retroperitoneal)
Attachment of sigmoid mesocolon and sigmoid vessels
Testicular vessels (retroperitoneal)
Superior rectal vessels
Ureters (retroperitoneal)
Rectum
Sacrogenital fold (ligament)
Urinary bladder
Lateral umbilical fold (contains inferior epigastric vessels)
Median umbilical fold (contains urachus)
Medial umbilical fold (contains fibrous part of umbilical artery)
F. Netter M.D.

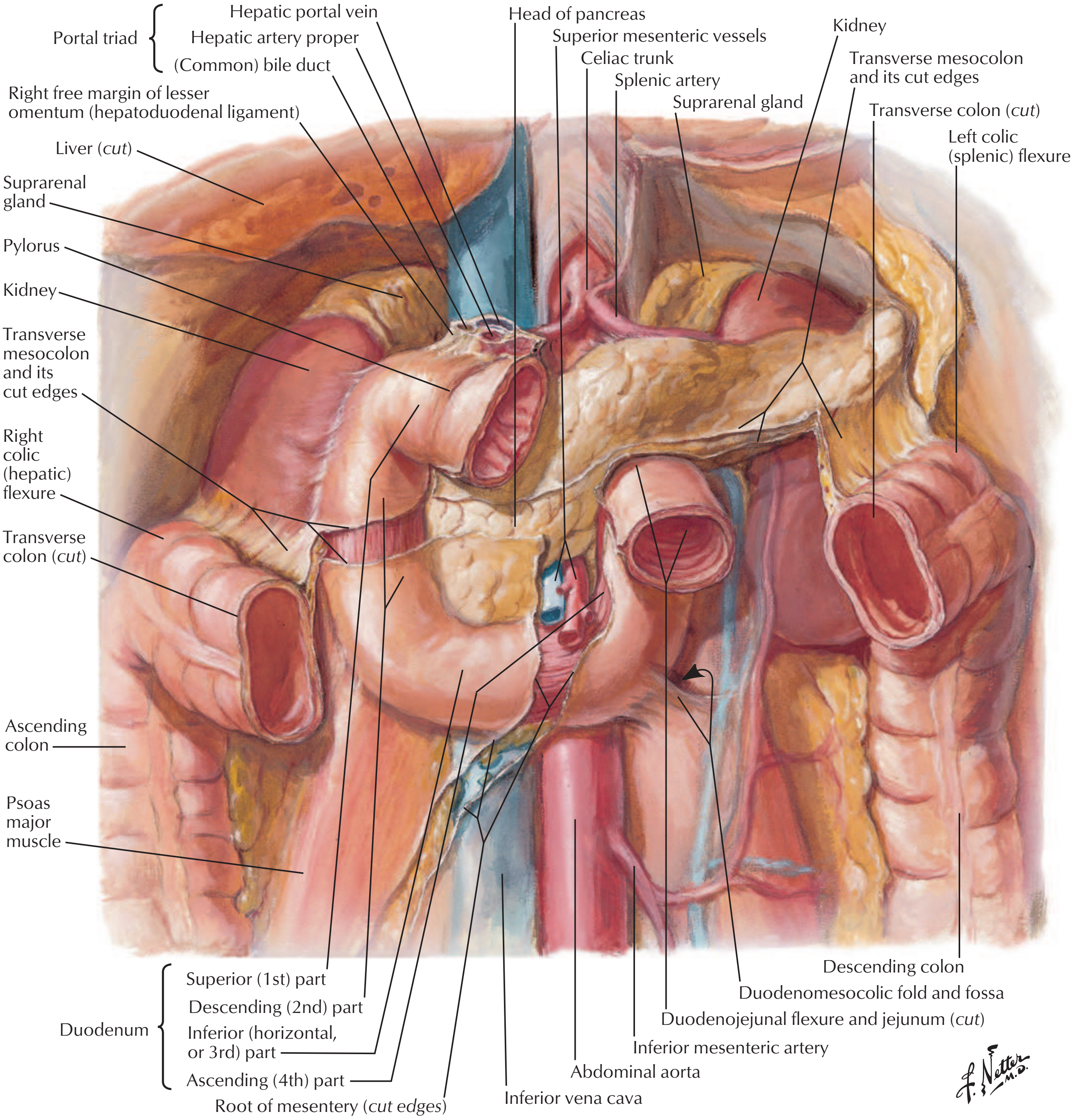

Left lobe of liver
Hepatoduodenal ligament
Hepatogastric ligament
Lesser omentum
Falciform ligament
Abdominal part of esophagus
Cardiac notch (incisure)
Fundus of stomach
Respiratory diaphragm
Spleen
Round ligament of liver (obliterated left umbilical vein)
Inferior border of liver
Quadrate lobe of liver
Cardiac part of stomach
Right lobe of liver
Gallbladder
Lesser curvature
Body of stomach
Omental foramen (of Winslow)
Angular notch
Pyloric canal
Caudate lobe of liver
Pyloric part of stomach
Pylorus
Greater curvature
Duodenum
Pyloric antrum
Right kidney (retro-peritoneal)
Right colic (hepatic) flexure
Greater omentum
Left colic (splenic) flexure

Transverse gray-scale ultrasound image of midabdomen

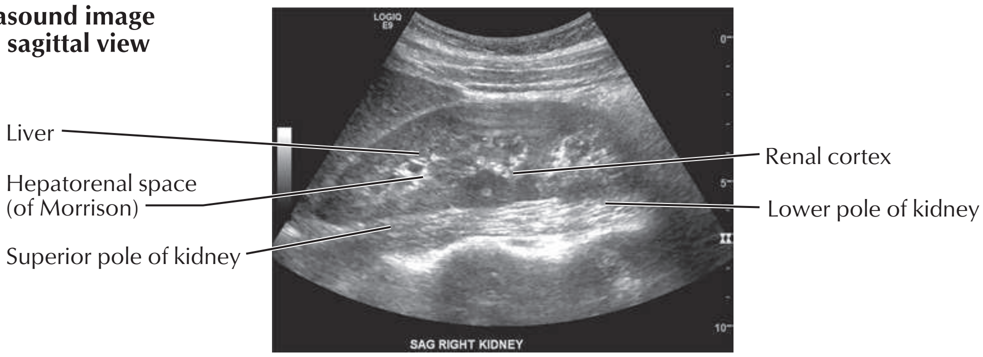

LOGIQ E9
Liver, left lobe
Head of pancreas
Body of pancreas
Hepatic portal vein
Superior mesenteric artery
Inferior vena cava
Abdominal aorta


Zigzag (Z) line (junction of gastric and esophageal mucosa)
Cardiac zone
Gastric and fundic zones
Cardiac orifice
Superior (1st) part of duodenum (ampulla, or duodenal bulb)
Gastric folds (rugae)
Longitudinal folds of gastric canal (magenstrasse)
Pylorus
Pyloric sphincter
Longitudinal muscle of esophagus
Pyloric zone
Outer longitudinal muscle layer of stomach (concentrated chiefly at lesser and greater curvatures and at pyloric part)
Longitudinal muscle of duodenum
Middle circular muscle layer of stomach
Outer longitudinal muscle layer (*cut away*)
Middle circular and innermost oblique fibers blend here
Longitudinal section through pyloric region (shows thickened pyloric sphincter)
Middle circular muscle layer
Innermost abdominal oblique muscle layer
Circular muscle of duodenum
Longitudinal muscle of duodenum (*cut away*)
Windows cut in middle circular muscle layer

See also **Plate 275**

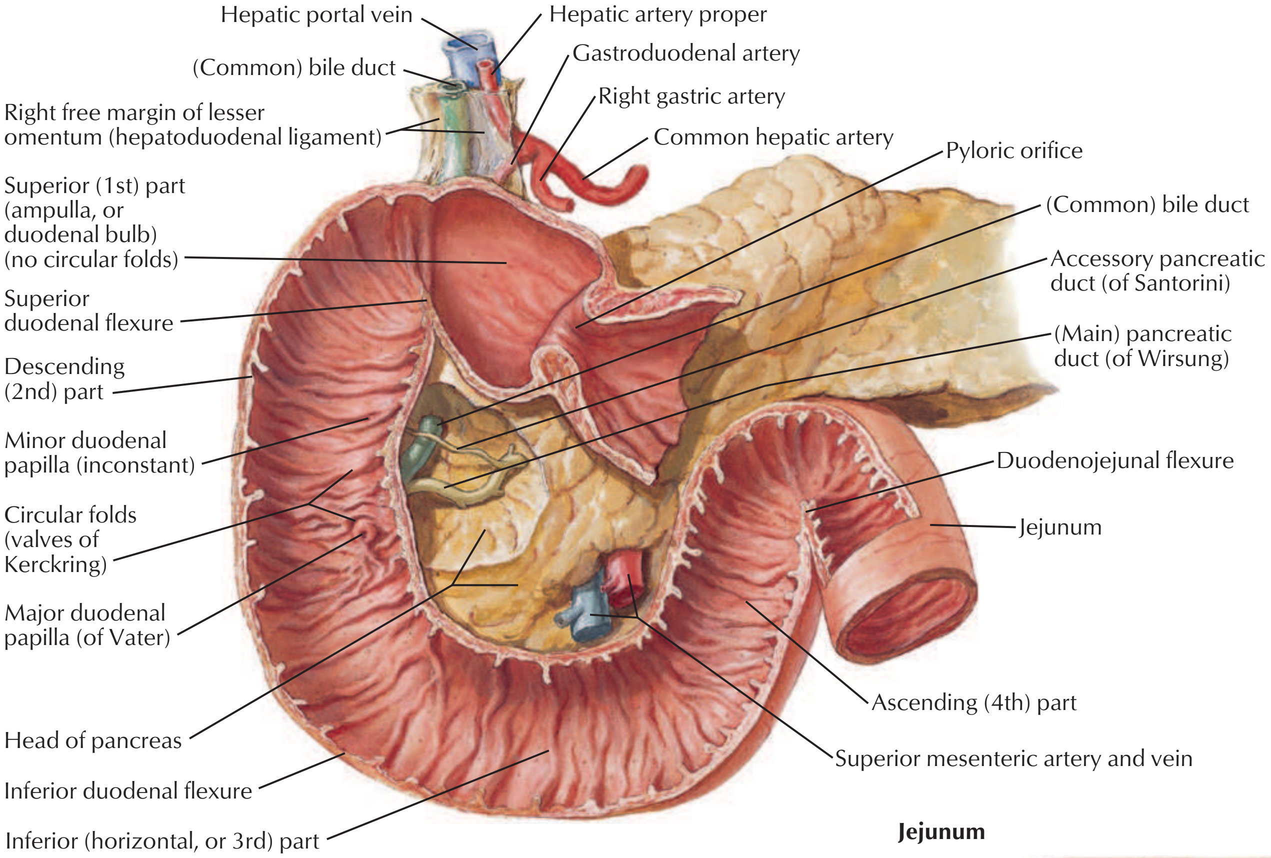

Portal triad
Hepatic portal vein
Hepatic artery proper
(Common) bile duct
Right free margin of lesser omentum (hepatoduodenal ligament)
Liver (*cut*)
Suprarenal gland
Pylorus
Kidney
Transverse mesocolon and its cut edges
Right colic (hepatic) flexure
Transverse colon (*cut*)
Ascending colon
Psoas major muscle
Head of pancreas
Superior mesenteric vessels
Celiac trunk
Splenic artery
Suprarenal gland
Kidney
Transverse mesocolon and its cut edges
Transverse colon (*cut*)
Left colic (splenic) flexure
Descending colon
Duodenomesocolic fold and fossa
Duodenojejunal flexure and jejunum (*cut*)
Inferior mesenteric artery
Abdominal aorta
Inferior vena cava
Duodenum
Superior (1st) part
Descending (2nd) part
Inferior (horizontal, or 3rd) part
Ascending (4th) part
Root of mesentery (*cut edges*)
F. Netter M.D.

Gray-scale ultrasound image of right kidney, sagittal view

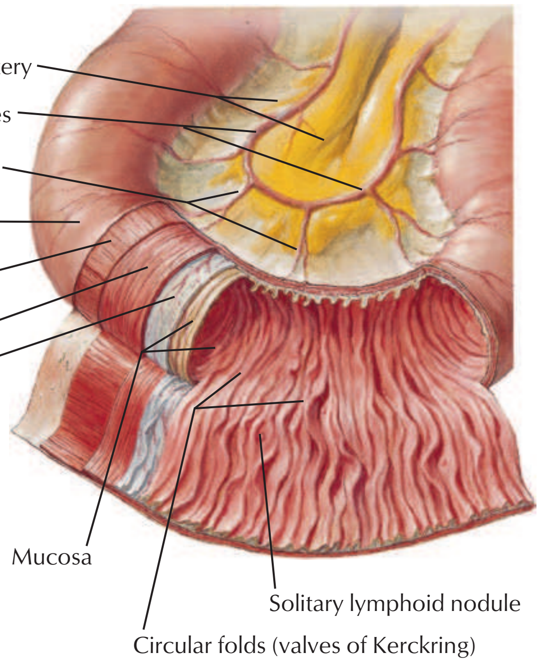

LOGIQ E9
SAG RIGHT KIDNEY
Liver
Hepatorenal space (of Morrison)
Superior pole of kidney
Renal cortex
Lower pole of kidney
0
5
10

Mucosa and Musculature of Small Intestine

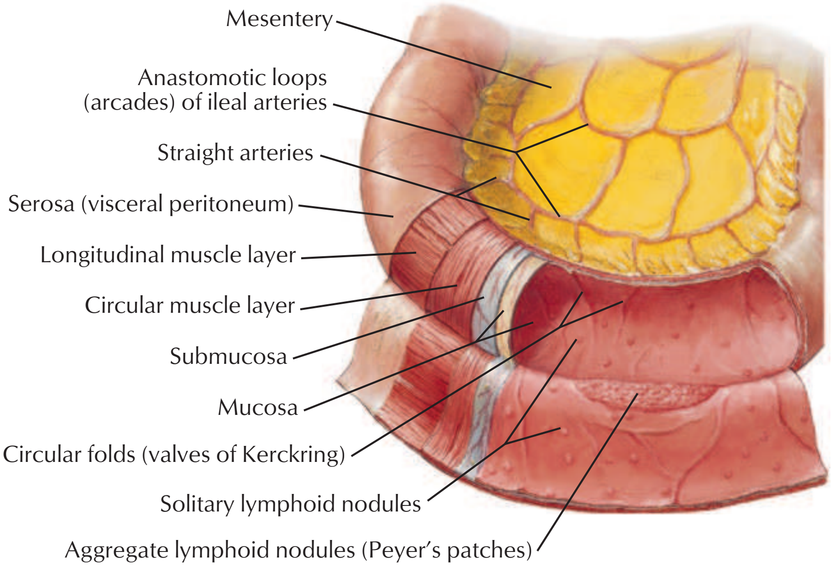
See also Plate 277


Hepatic portal vein
(Common) bile duct
Right free margin of lesser omentum (hepatoduodenal ligament)
Superior (1st) part (ampulla, or duodenal bulb) (no circular folds)
Superior duodenal flexure
Descending (2nd) part
Minor duodenal papilla (inconstant)
Circular folds (valves of Kerckring)
Major duodenal papilla (of Vater)
Head of pancreas
Inferior duodenal flexure
Inferior (horizontal, or 3rd) part
Hepatic artery proper
Gastroduodenal artery
Right gastric artery
Common hepatic artery
Pyloric orifice
(Common) bile duct
Accessory pancreatic duct (of Santorini)
(Main) pancreatic duct (of Wirsung)
Duodenojejunal flexure
Jejunum
Ascending (4th) part
Superior mesenteric artery and vein

Jejunum


Mesentery
Anastomotic loop (arcade) of jejunal arteries
Straight arteries
Serosa (visceral peritoneum)
Longitudinal muscle layer
Circular muscle layer
Submucosa
Mucosa
Solitary lymphoid nodule
Circular folds (valves of Kerckring)

Ileum


Mesentery
Anastomotic loops (arcades) of ileal arteries
Straight arteries
Serosa (visceral peritoneum)
Longitudinal muscle layer
Circular muscle layer
Submucosa
Mucosa
Circular folds (valves of Kerckring)
Solitary lymphoid nodules
Aggregate lymphoid nodules (Peyer's patches)

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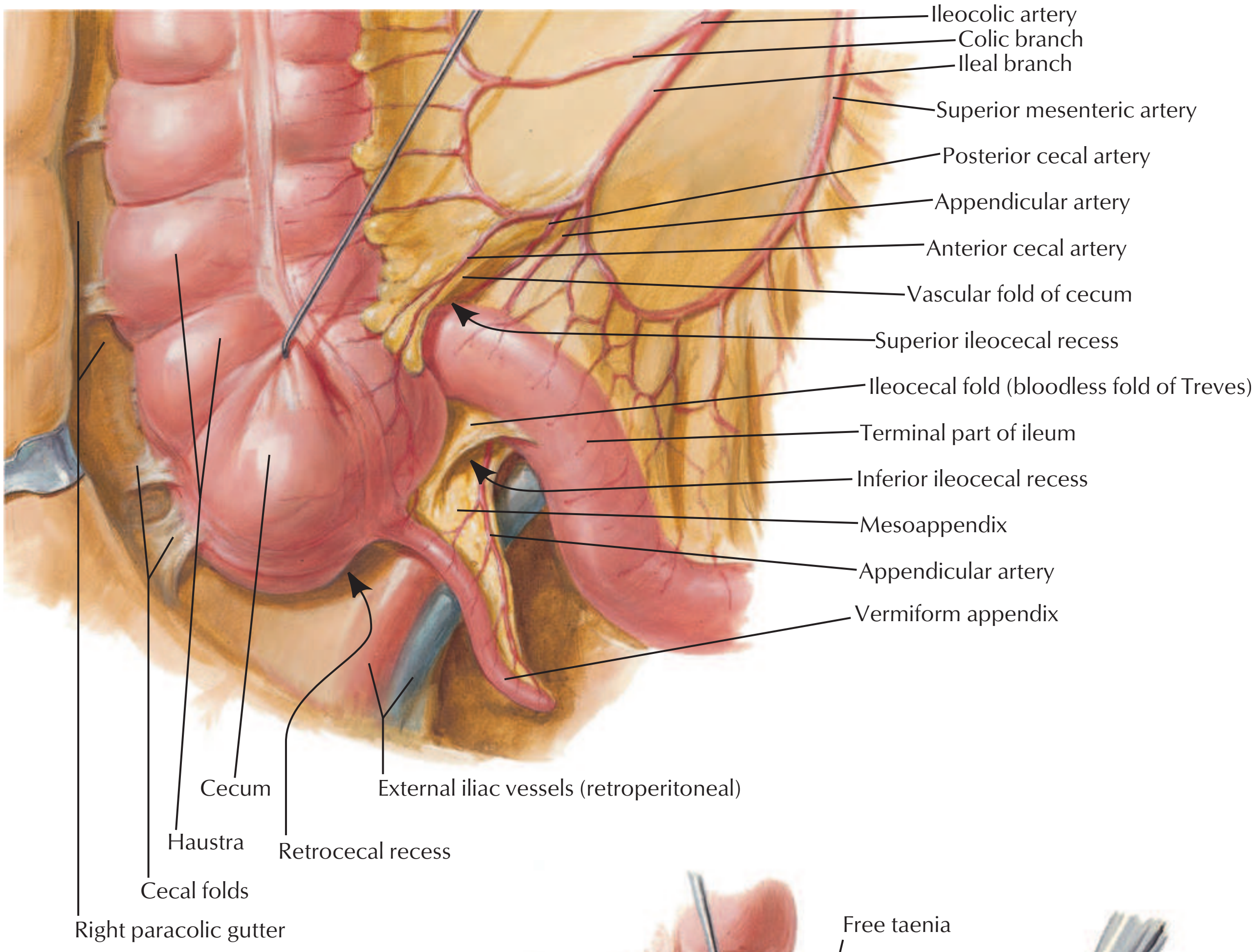
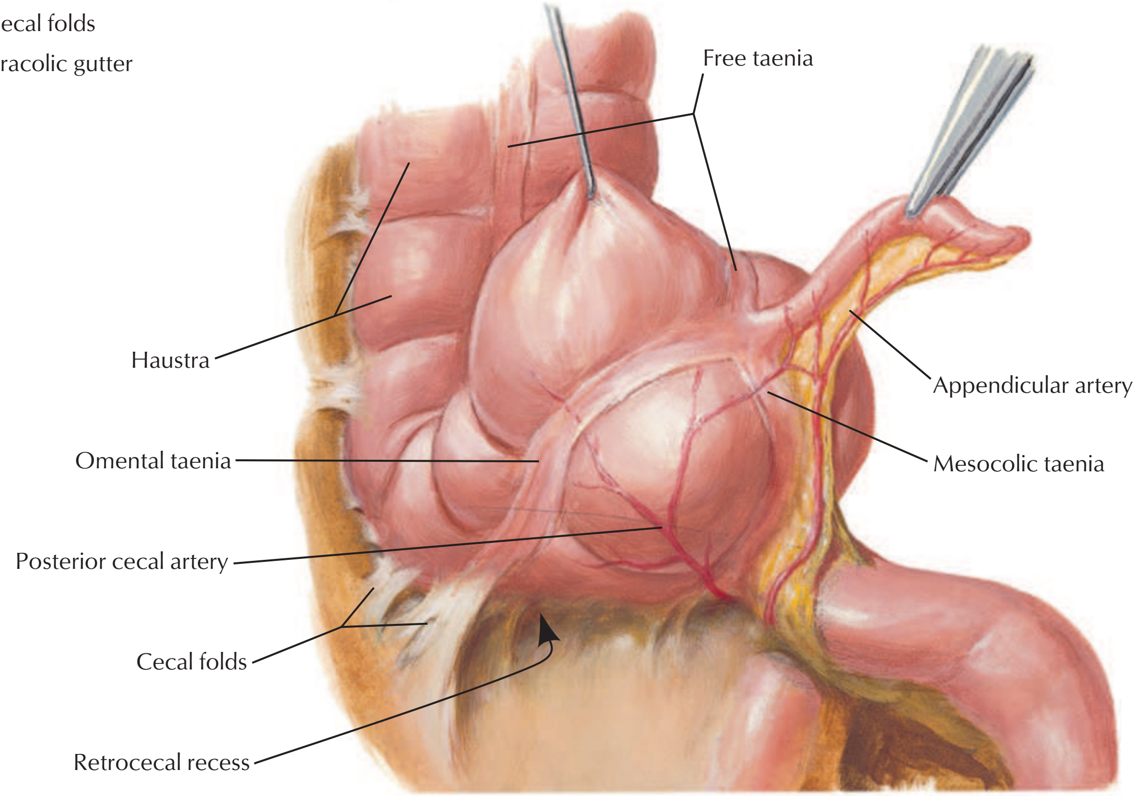
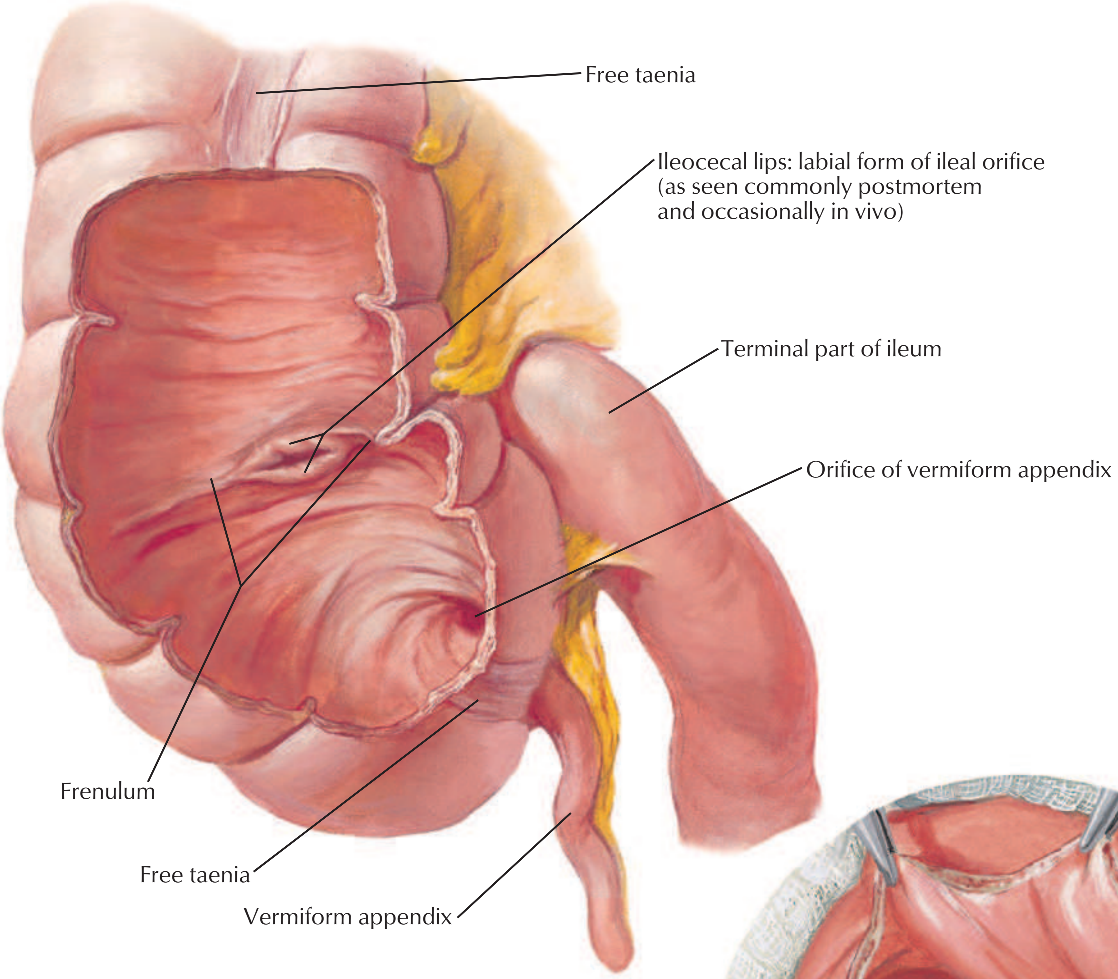
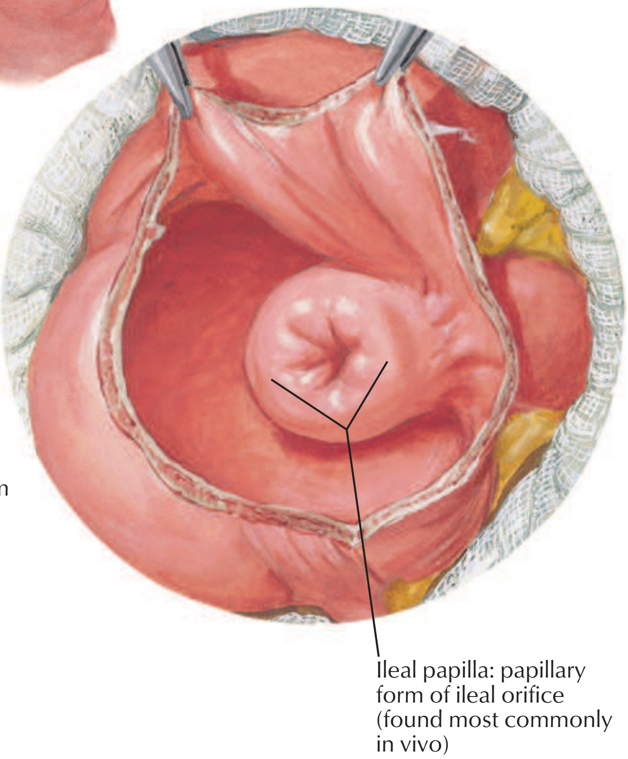
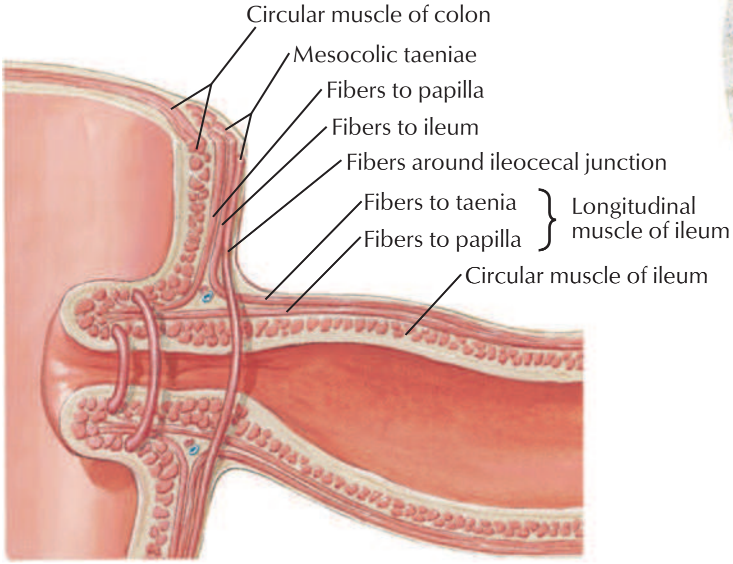
See also Plates 294, 295


Ileocolic artery
Colic branch
Ileal branch
Superior mesenteric artery
Posterior cecal artery
Appendicular artery
Anterior cecal artery
Vascular fold of cecum
Superior ileocecal recess
Ileocecal fold (bloodless fold of Treves)
Terminal part of ileum
Inferior ileocecal recess
Mesoappendix
Appendicular artery
Vermiform appendix
Cecum
External iliac vessels (retroperitoneal)
Haustra
Retrocecal recess
Cecal folds
Right paracolic gutter


Free taenia
Haustra
Appendicular artery
Omental taenia
Mesocolic taenia
Posterior cecal artery
Cecal folds
Retrocecal recess


Free taenia
Ileocecal lips: labial form of ileal orifice (as seen commonly postmortem and occasionally in vivo)
Terminal part of ileum
Orifice of vermiform appendix
Frenulum
Free taenia
Vermiform appendix


Ileal papilla: papillary form of ileal orifice (found most commonly in vivo)


Circular muscle of colon
Mesocolic taeniae
Fibers to papilla
Fibers to ileum
Fibers around ileocecal junction
Fibers to taenia
Fibers to papilla
Longitudinal muscle of ileum
Circular muscle of ileum

Schema of muscle fibers at ileal orifice

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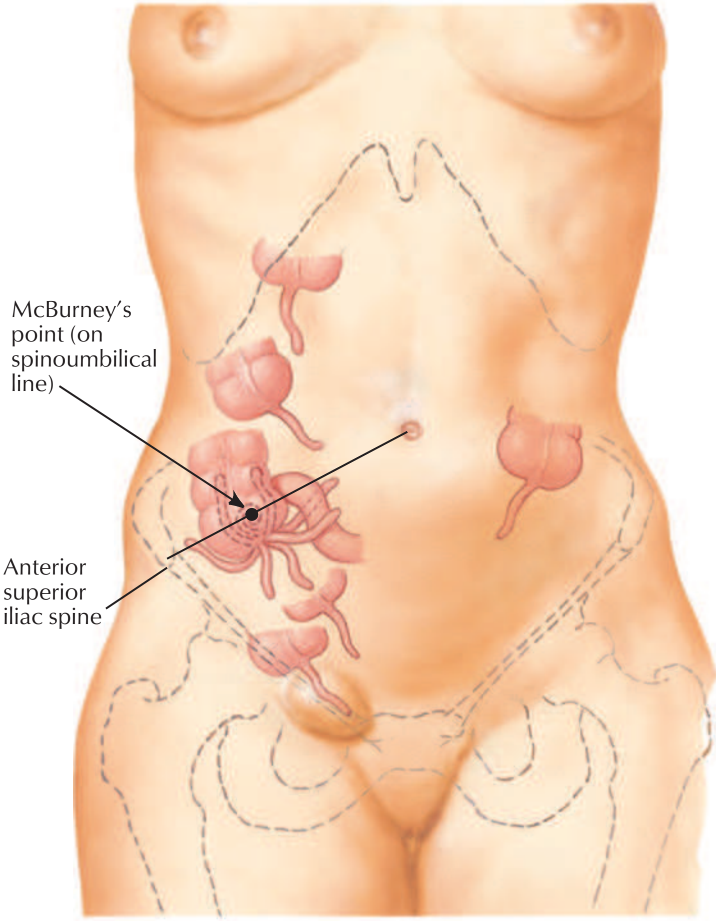
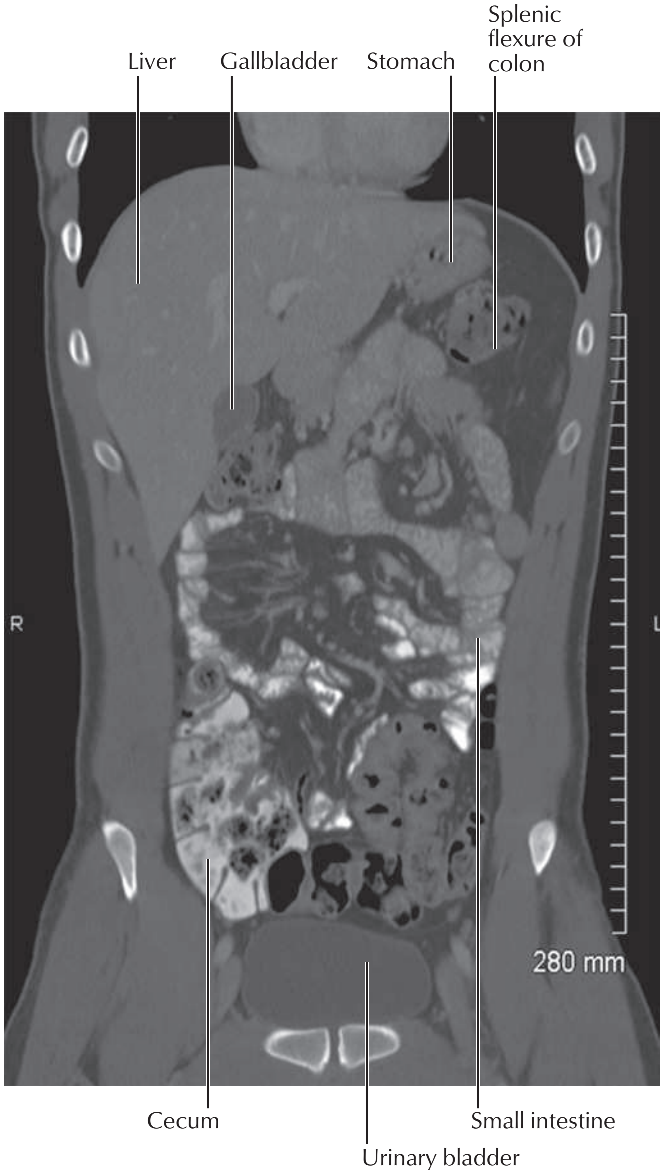
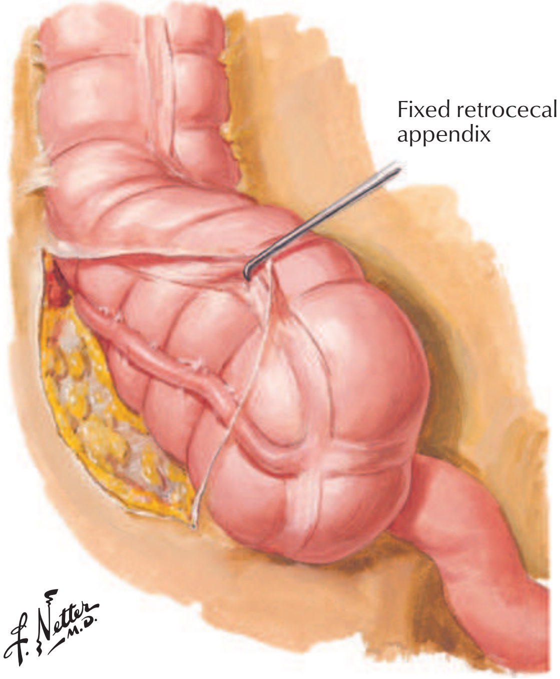

McBurney's point (on spinoumbilical line)
Anterior superior iliac spine

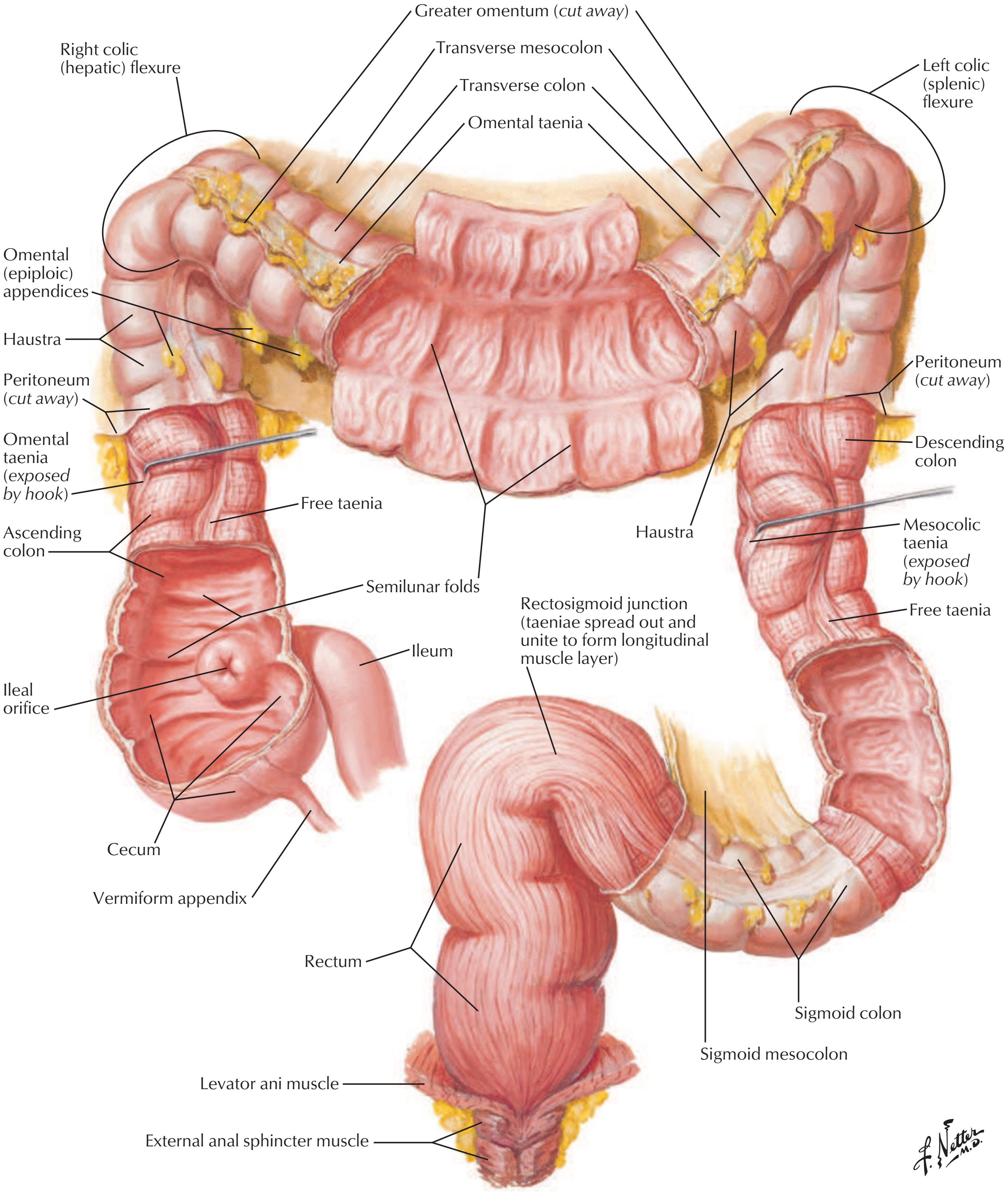
Variations in position of appendix

Coronal CT image with oral and intravenous contrast


Liver
Gallbladder
Stomach
Splenic flexure of colon
R
L
280 mm
Cecum
Small intestine
Urinary bladder


Fixed retrocecal appendix

See also **Plate 295**


Greater omentum (*cut away*)
Transverse mesocolon
Transverse colon
Omental taenia
Right colic (hepatic) flexure
Left colic (splenic) flexure
Omental (epiploic) appendices
Haustra
Peritoneum (*cut away*)
Omental taenia (*exposed by hook*)
Free taenia
Ascending colon
Peritoneum (*cut away*)
Descending colon
Haustra
Mesocolic taenia (*exposed by hook*)
Free taenia
Semilunar folds
Rectosigmoid junction (taeniae spread out and unite to form longitudinal muscle layer)
Ileum
Ileal orifice
Cecum
Vermiform appendix
Rectum
Sigmoid colon
Sigmoid mesocolon
Levator ani muscle
External anal sphincter muscle
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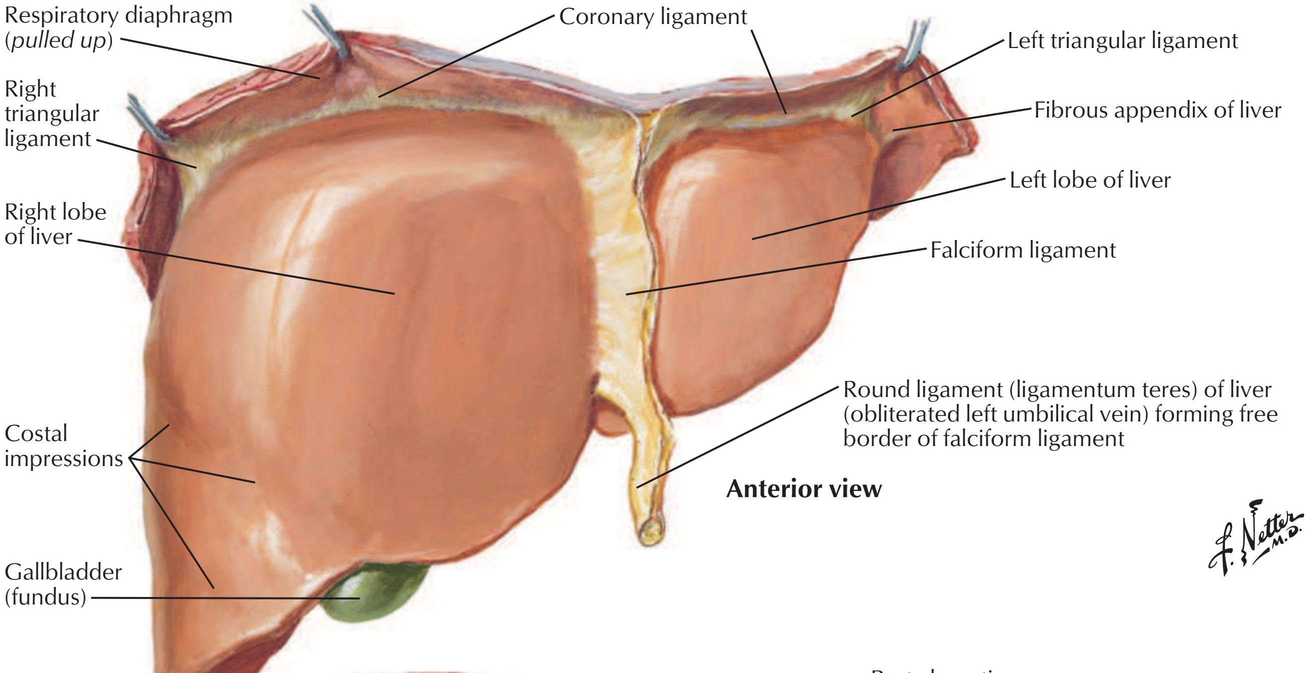
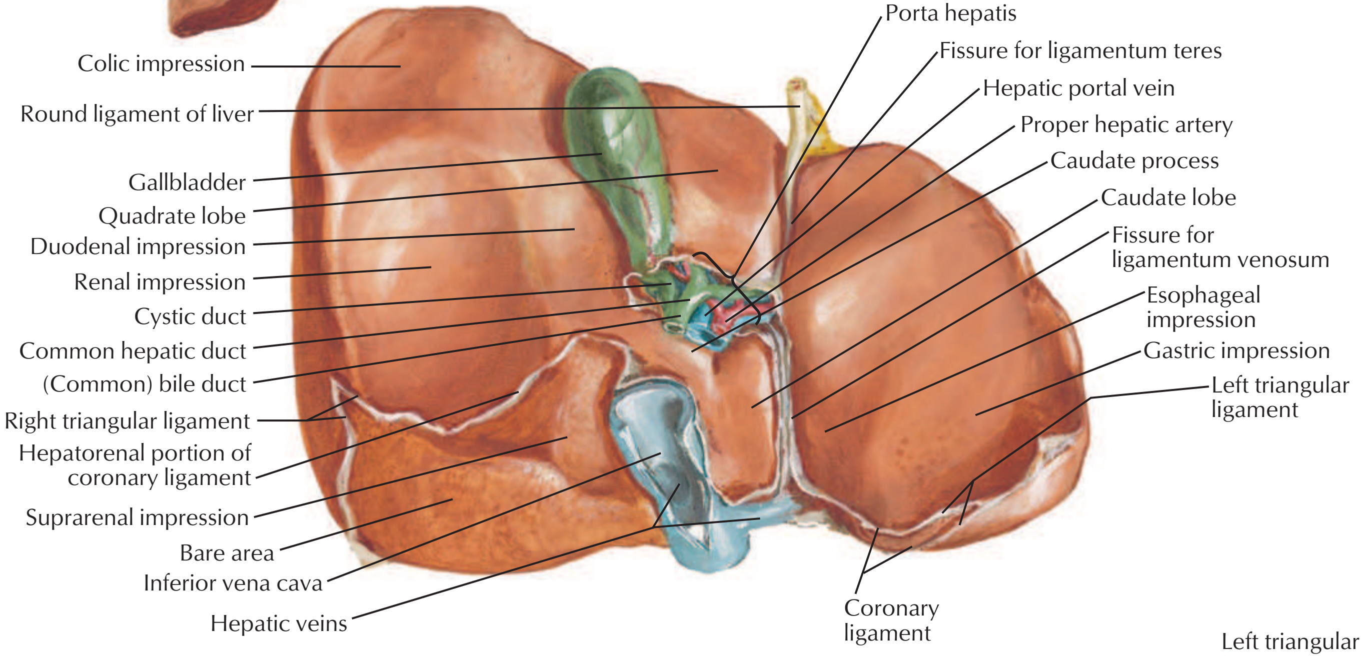
Surfaces and Bed of Liver

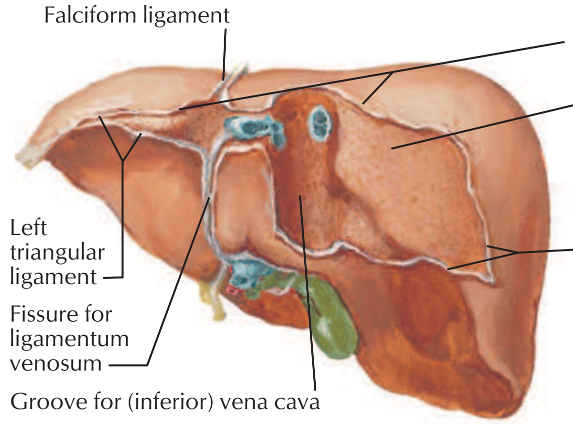
See also **Plate 275**


Respiratory diaphragm (*pulled up*)
Coronary ligament
Left triangular ligament
Right triangular ligament
Fibrous appendix of liver
Left lobe of liver
Right lobe of liver
Falciform ligament
Round ligament (ligamentum teres) of liver (obliterated left umbilical vein) forming free border of falciform ligament
Costal impressions
Gallbladder (fundus)

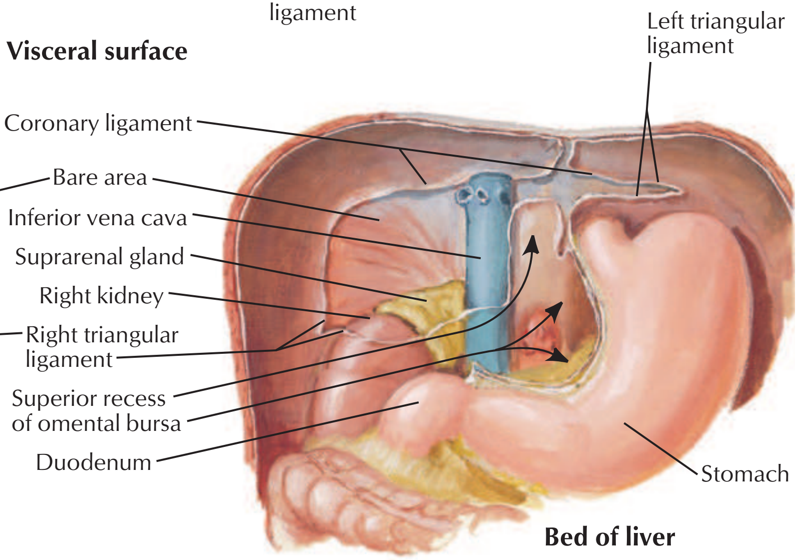
Anterior view


Porta hepatis
Fissure for ligamentum teres
Colic impression
Hepatic portal vein
Round ligament of liver
Proper hepatic artery
Caudate process
Gallbladder
Caudate lobe
Quadrate lobe
Fissure for ligamentum venosum
Duodenal impression
Renal impression
Esophageal impression
Cystic duct
Common hepatic duct
Gastric impression
(Common) bile duct
Left triangular ligament
Right triangular ligament
Hepatorenal portion of coronary ligament
Suprarenal impression
Bare area
Inferior vena cava
Coronary ligament
Hepatic veins

Visceral surface

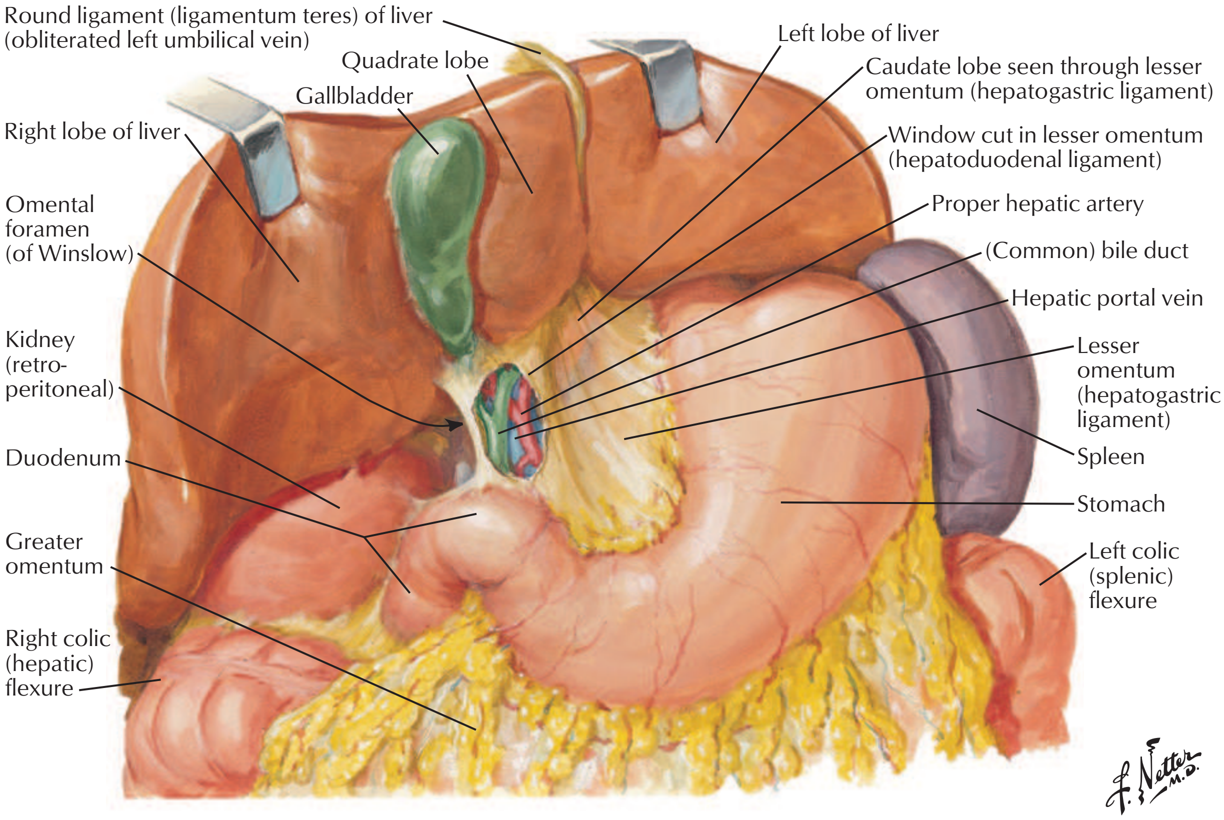

Falciform ligament
Left triangular ligament
Fissure for ligamentum venosum
Groove for (inferior) vena cava

Posterior view


Left triangular ligament
Coronary ligament
Bare area
Inferior vena cava
Suprarenal gland
Right kidney
Right triangular ligament
Superior recess of omental bursa
Duodenum
Stomach

Bed of liver

See also Plate 274


Round ligament (ligamentum teres) of liver (obliterated left umbilical vein)
Quadrate lobe
Gallbladder
Right lobe of liver
Omental foramen (of Winslow)
Kidney (retro-peritoneal)
Duodenum
Greater omentum
Right colic (hepatic) flexure
Left lobe of liver
Caudate lobe seen through lesser omentum (hepatogastric ligament)
Window cut in lesser omentum (hepatoduodenal ligament)
Proper hepatic artery
(Common) bile duct
Hepatic portal vein
Lesser omentum (hepatogastric ligament)
Spleen
Stomach
Left colic (splenic) flexure
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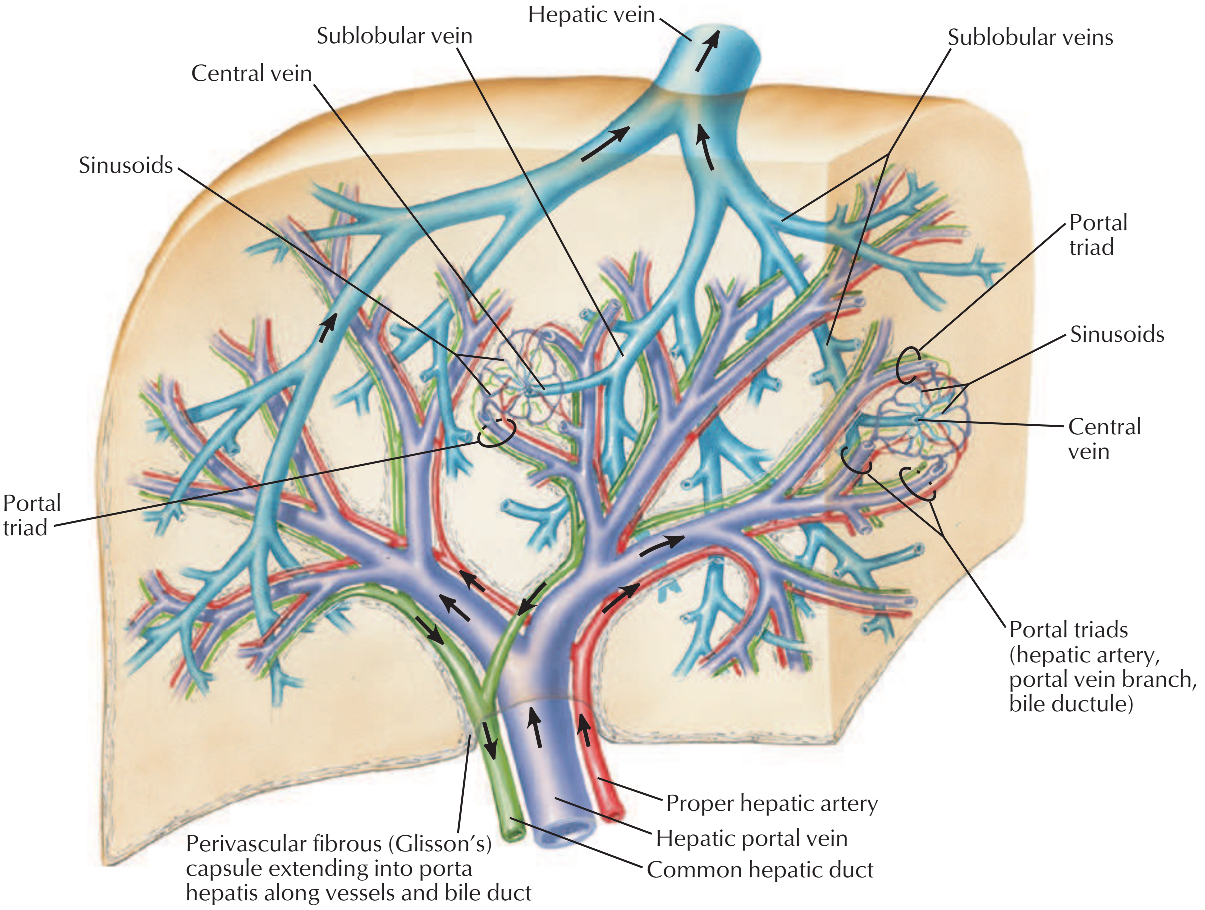
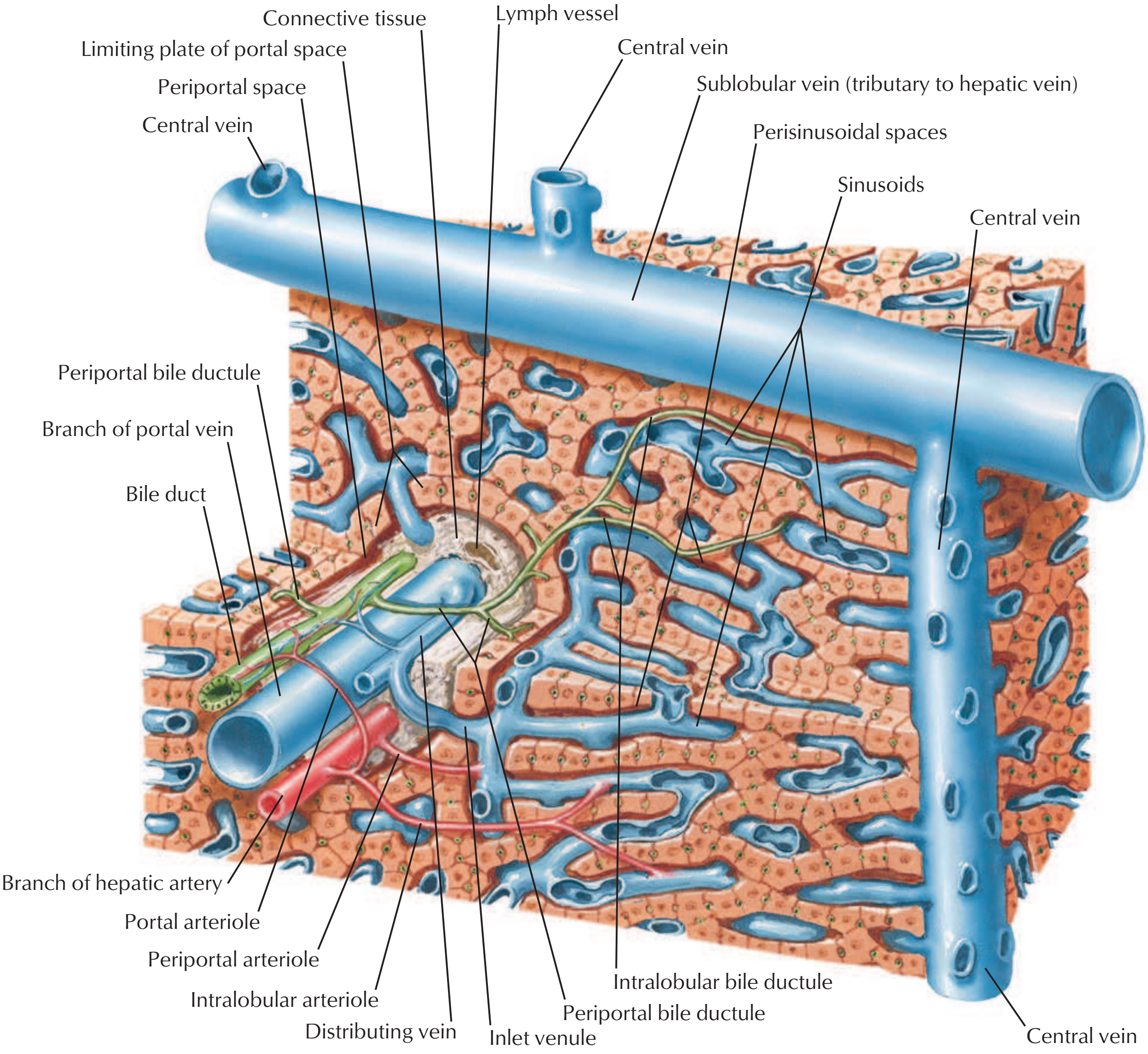
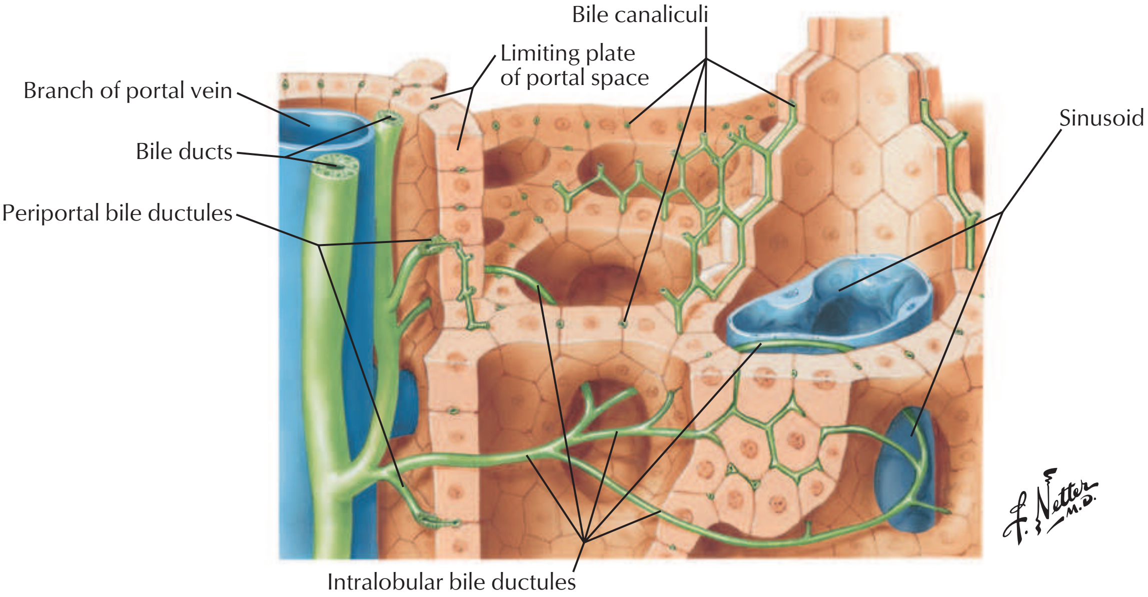
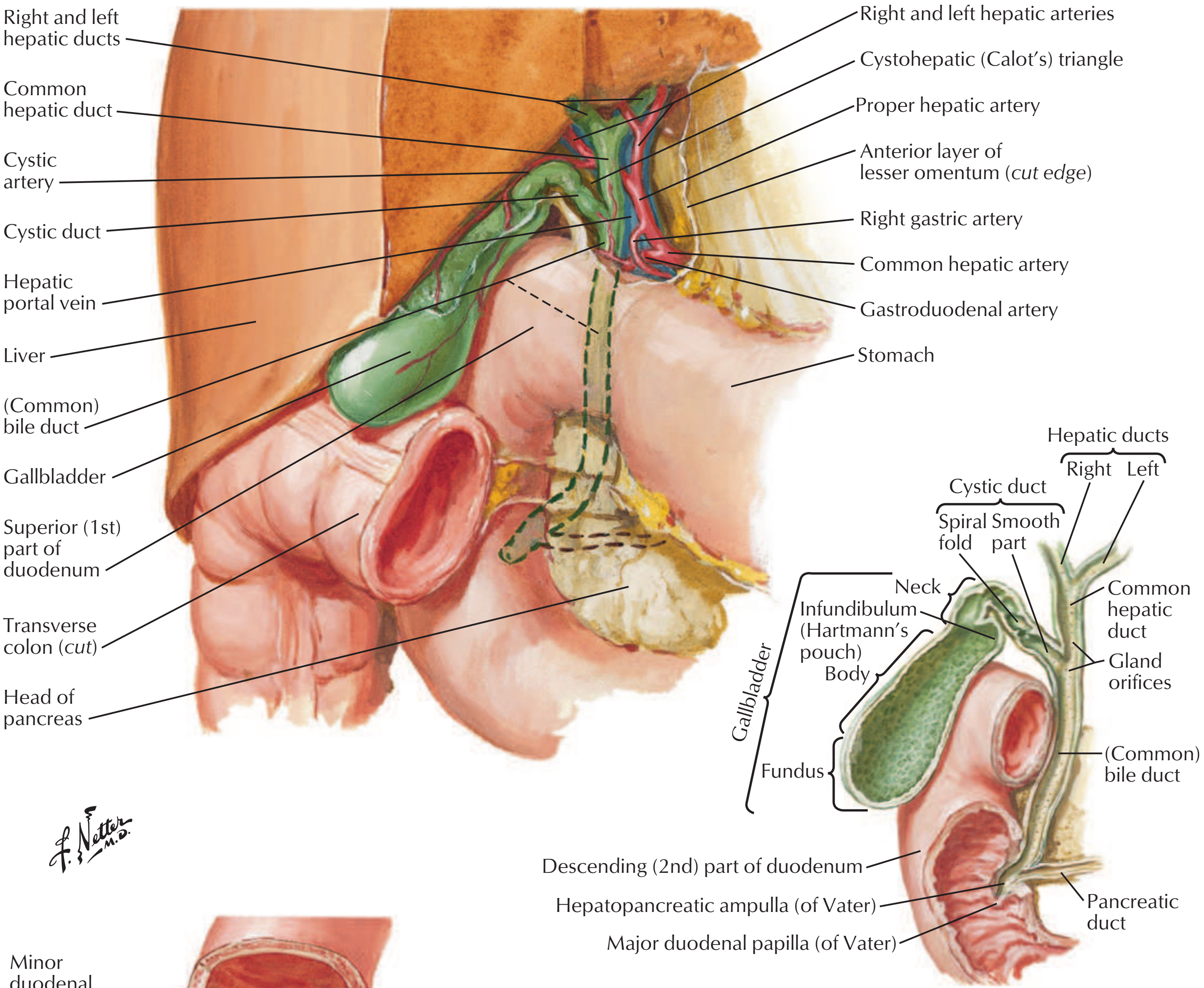
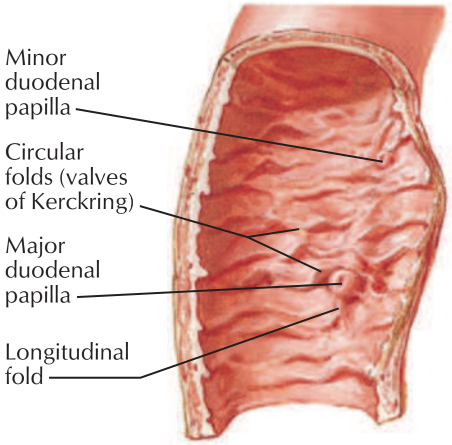

Hepatic vein
Sublobular vein
Sublobular veins
Central vein
Sinusoids
Portal triad
Sinusoids
Central vein
Portal triad
Portal triads (hepatic artery, portal vein branch, bile ductule)
Proper hepatic artery
Hepatic portal vein
Common hepatic duct
Perivascular fibrous (Glisson's) capsule extending into porta hepatis along vessels and bile duct

Liver Structure: Schema

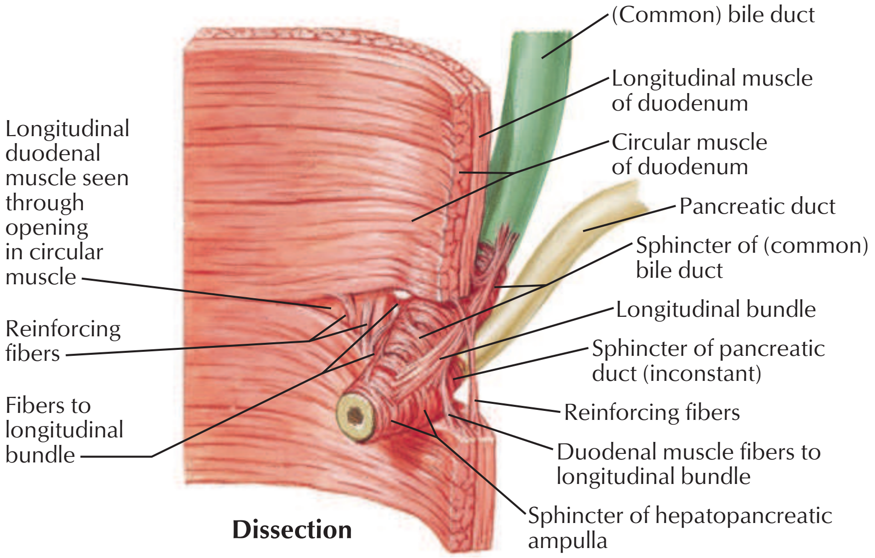

Connective tissue
Lymph vessel
Limiting plate of portal space
Central vein
Periportal space
Sublobular vein (tributary to hepatic vein)
Central vein
Perisinusoidal spaces
Sinusoids
Central vein
Periportal bile ductule
Branch of portal vein
Bile duct
Branch of hepatic artery
Portal arteriole
Periportal arteriole
Intralobular arteriole
Distributing vein
Inlet venule
Periportal bile ductule
Intralobular bile ductule
Central vein


Bile canaliculi
Limiting plate of portal space
Branch of portal vein
Bile ducts
Periportal bile ductules
Sinusoid
Intralobular bile ductules


Right and left hepatic ducts
Common hepatic duct
Cystic artery
Cystic duct
Hepatic portal vein
Liver
(Common) bile duct
Gallbladder
Superior (1st) part of duodenum
Transverse colon (*cut*)
Head of pancreas
Right and left hepatic arteries
Cystohepatic (Calot's) triangle
Proper hepatic artery
Anterior layer of lesser omentum (*cut edge*)
Right gastric artery
Common hepatic artery
Gastroduodenal artery
Stomach
F. Netter M.D.
Hepatic ducts
Right
Left
Cystic duct
Spiral fold
Smooth part
Neck
Infundibulum (Hartmann's pouch)
Body
Gallbladder
Fundus
Common hepatic duct
Gland orifices
(Common) bile duct
Descending (2nd) part of duodenum
Hepatopancreatic ampulla (of Vater)
Major duodenal papilla (of Vater)
Pancreatic duct

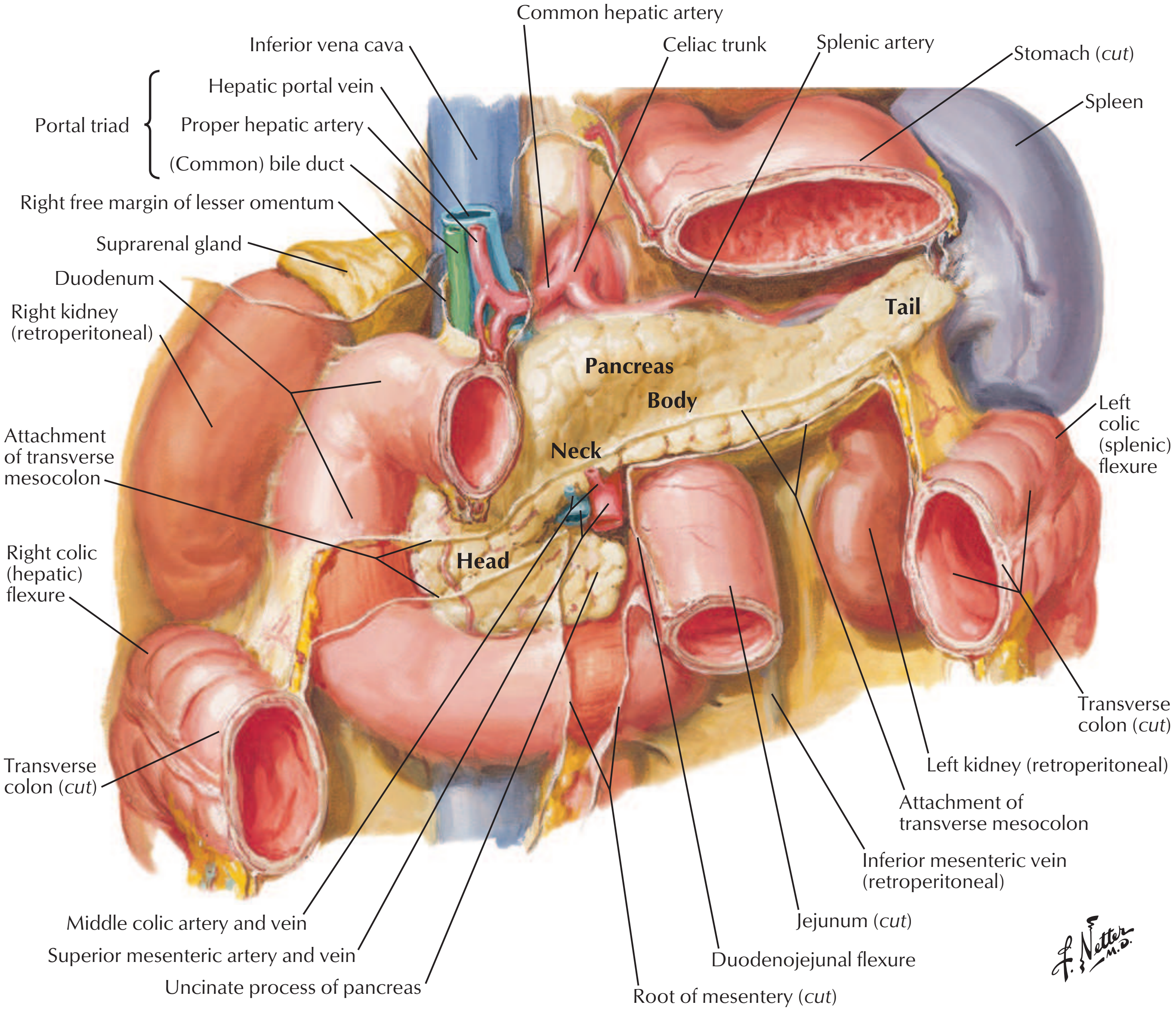

Minor duodenal papilla
Circular folds (valves of Kerckring)
Major duodenal papilla
Longitudinal fold

Interior of descending (2nd) part of duodenum

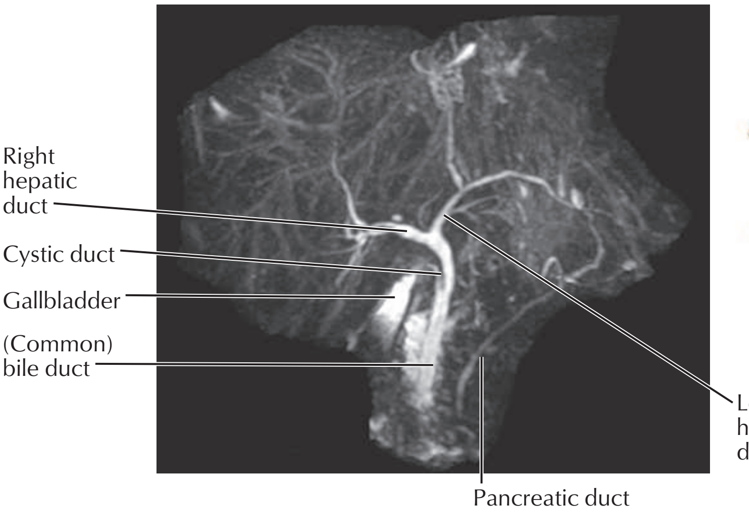

(Common) bile duct
Longitudinal muscle of duodenum
Circular muscle of duodenum
Pancreatic duct
Sphincter of (common) bile duct
Longitudinal bundle
Sphincter of pancreatic duct (inconstant)
Reinforcing fibers
Duodenal muscle fibers to longitudinal bundle
Sphincter of hepatopancreatic ampulla
Longitudinal duodenal muscle seen through opening in circular muscle
Reinforcing fibers
Fibers to longitudinal bundle

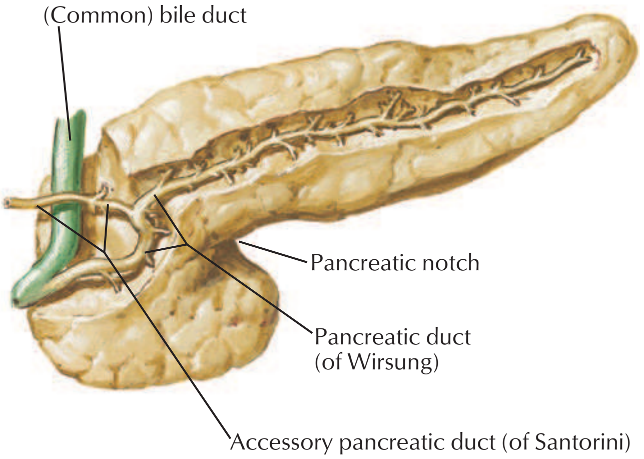
Dissection

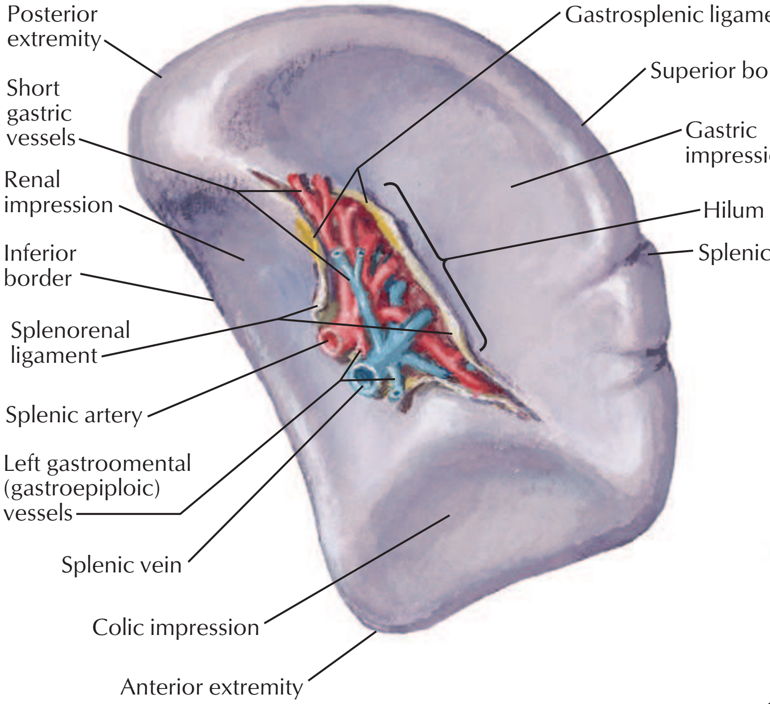
Pancreas in Situ


Common hepatic artery
Inferior vena cava
Celiac trunk
Splenic artery
Stomach (*cut*)
Spleen
Portal triad
Hepatic portal vein
Proper hepatic artery
(Common) bile duct
Right free margin of lesser omentum
Suprarenal gland
Duodenum
Right kidney (retroperitoneal)
Tail
Pancreas
Body
Neck
Head
Left colic (splenic) flexure
Attachment of transverse mesocolon
Right colic (hepatic) flexure
Transverse colon (*cut*)
Transverse colon (*cut*)
Left kidney (retroperitoneal)
Attachment of transverse mesocolon
Inferior mesenteric vein (retroperitoneal)
Middle colic artery and vein
Superior mesenteric artery and vein
Uncinate process of pancreas
Jejunum (*cut*)
Duodenojejunal flexure
Root of mesentery (*cut*)

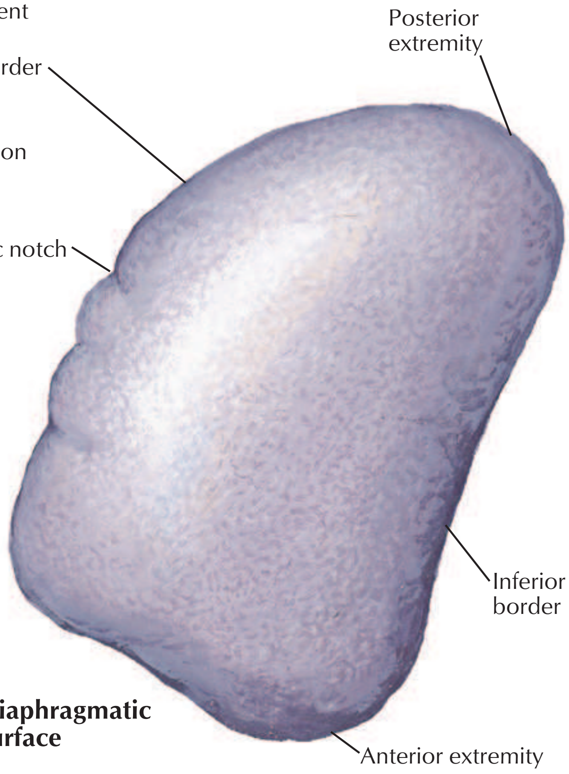
Magnetic resonance cholangiopancreatography (MRCP)


Right hepatic duct
Cystic duct
Gallbladder
(Common) bile duct
Left hepatic duct
Pancreatic duct

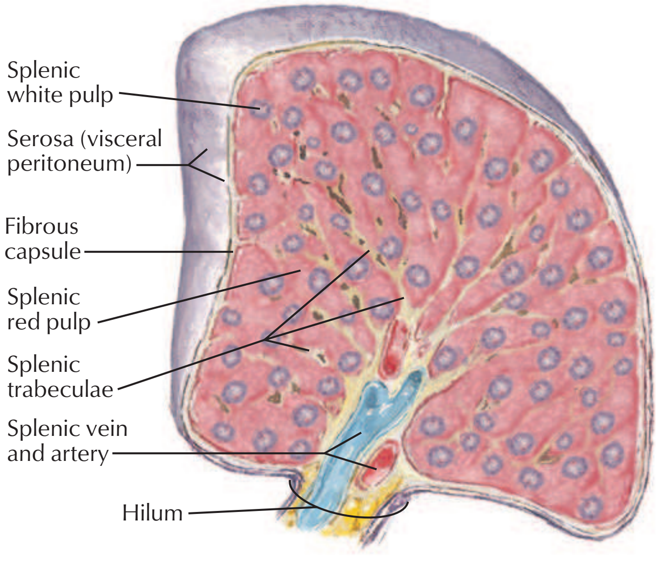

(Common) bile duct
Pancreatic notch
Pancreatic duct (of Wirsung)
Accessory pancreatic duct (of Santorini)


Posterior extremity
Short gastric vessels
Renal impression
Inferior border
Splenorenal ligament
Splenic artery
Left gastroomental (gastroepiploic) vessels
Splenic vein
Colic impression
Anterior extremity
Gastrosplenic ligament
Superior border
Gastric impression
Hilum
Splenic notch

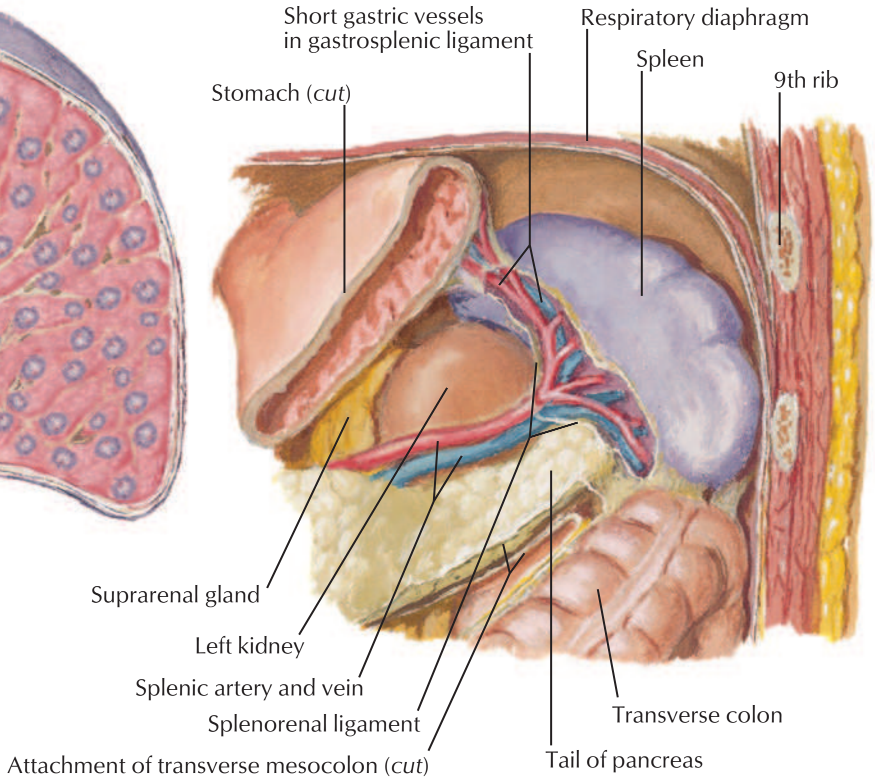
Visceral surface


Posterior extremity
Inferior border
Anterior extremity

Diaphragmatic surface


Splenic white pulp
Serosa (visceral peritoneum)
Fibrous capsule
Splenic red pulp
Splenic trabeculae
Splenic vein and artery
Hilum

Cross section


Short gastric vessels in gastrosplenic ligament
Respiratory diaphragm
Spleen
9th rib
Stomach (*cut*)
Suprarenal gland
Left kidney
Splenic artery and vein
Splenorenal ligament
Attachment of transverse mesocolon (*cut*)
Transverse colon
Tail of pancreas

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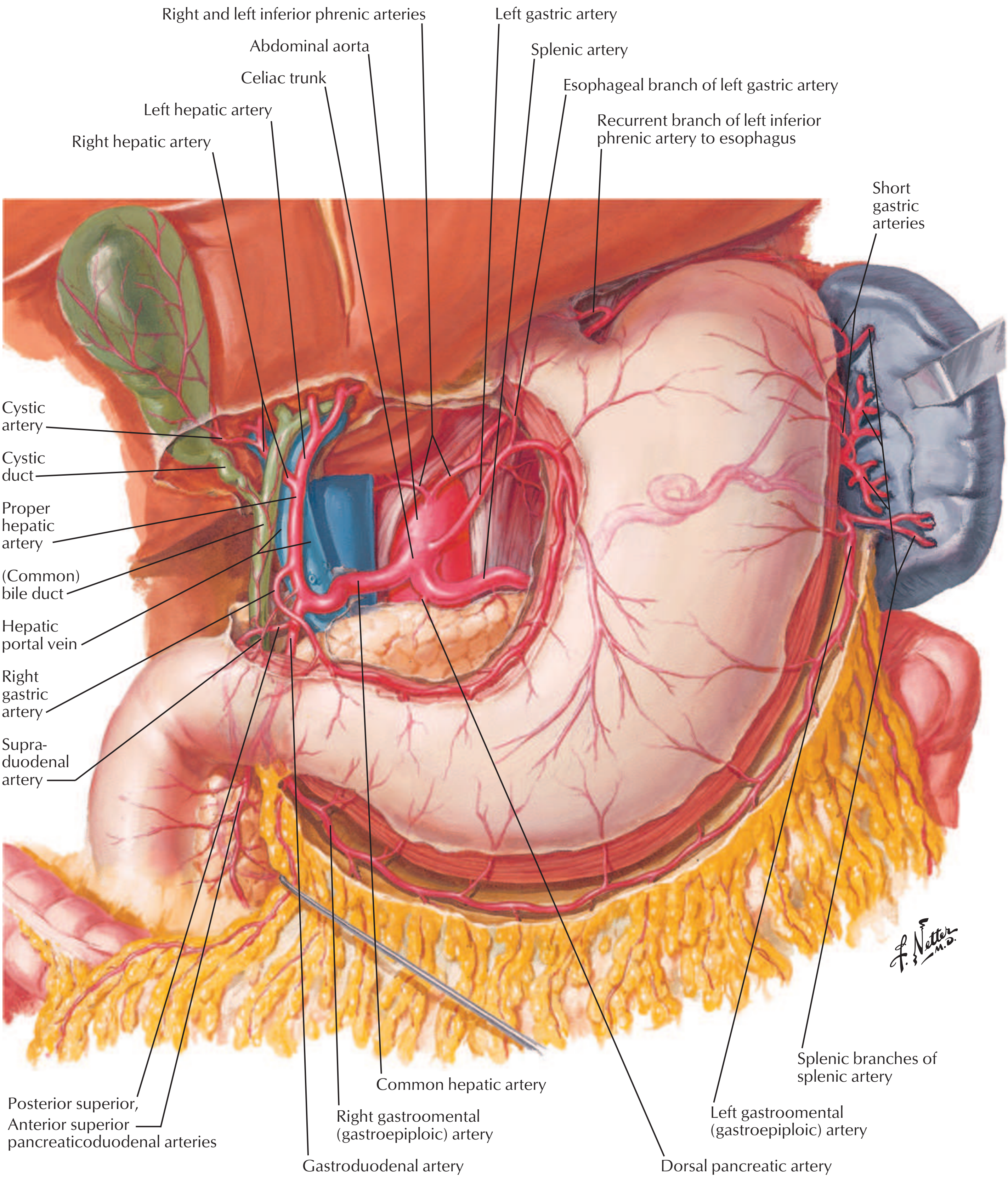
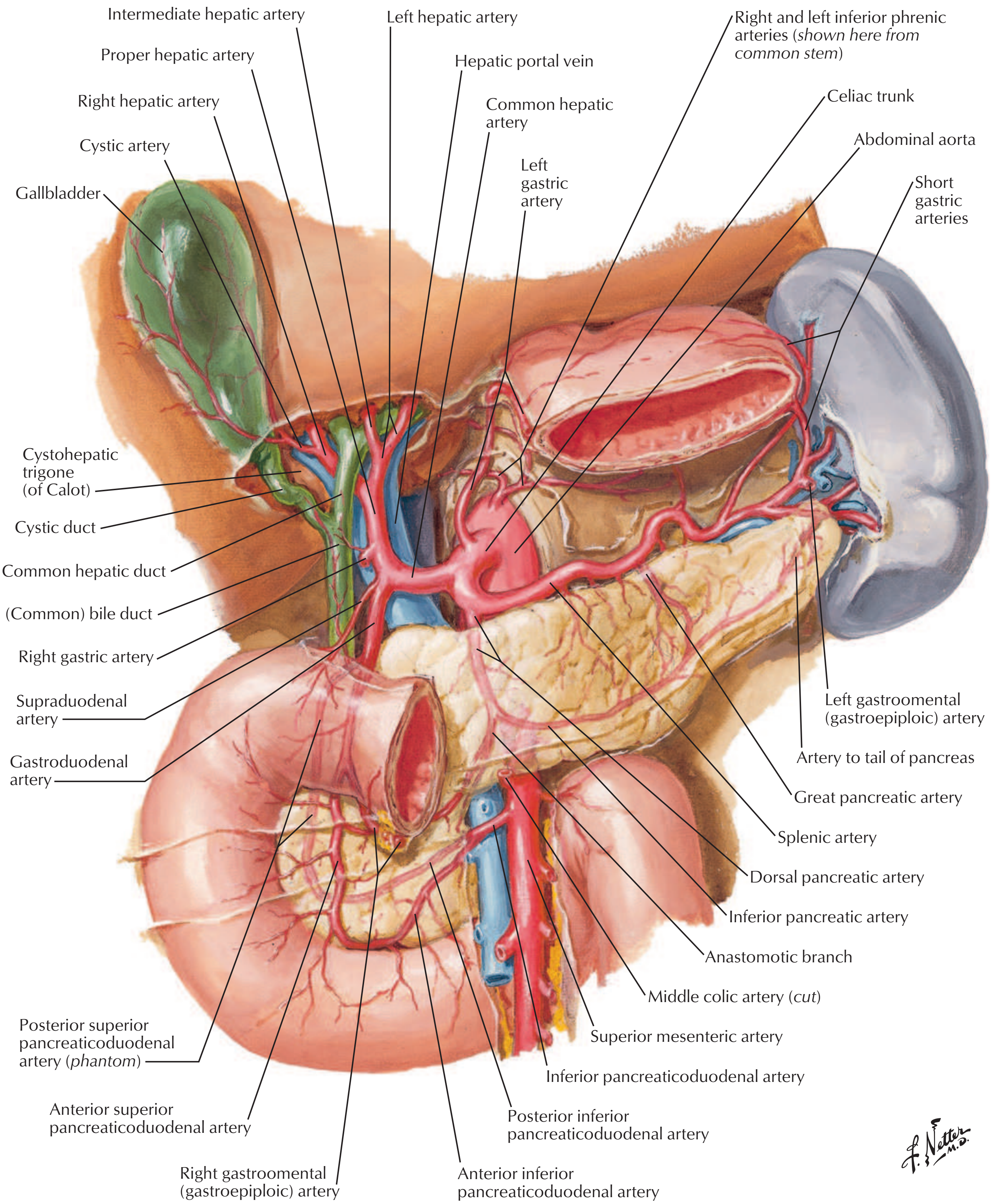
Spleen in situ


Right and left inferior phrenic arteries
Abdominal aorta
Celiac trunk
Left hepatic artery
Right hepatic artery
Left gastric artery
Splenic artery
Esophageal branch of left gastric artery
Recurrent branch of left inferior phrenic artery to esophagus
Short gastric arteries
Cystic artery
Cystic duct
Proper hepatic artery
(Common) bile duct
Hepatic portal vein
Right gastric artery
Supra-duodenal artery
Posterior superior,
Anterior superior
pancreaticoduodenal arteries
Gastroduodenal artery
Right gastroomental (gastroepiploic) artery
Common hepatic artery
Dorsal pancreatic artery
Left gastroomental (gastroepiploic) artery
Splenic branches of splenic artery


Intermediate hepatic artery
Proper hepatic artery
Right hepatic artery
Cystic artery
Gallbladder
Left hepatic artery
Hepatic portal vein
Common hepatic artery
Left gastric artery
Right and left inferior phrenic arteries (*shown here from common stem*)
Celiac trunk
Abdominal aorta
Short gastric arteries
Cystohepatic trigone (of Calot)
Cystic duct
Common hepatic duct
(Common) bile duct
Right gastric artery
Supraduodenal artery
Gastroduodenal artery
Left gastroomental (gastroepiploic) artery
Artery to tail of pancreas
Great pancreatic artery
Splenic artery
Dorsal pancreatic artery
Inferior pancreatic artery
Anastomotic branch
Middle colic artery (*cut*)
Superior mesenteric artery
Inferior pancreaticoduodenal artery
Posterior inferior pancreaticoduodenal artery
Anterior inferior pancreaticoduodenal artery
Posterior superior pancreaticoduodenal artery (*phantom*)
Anterior superior pancreaticoduodenal artery
Right gastroomental (gastroepiploic) artery
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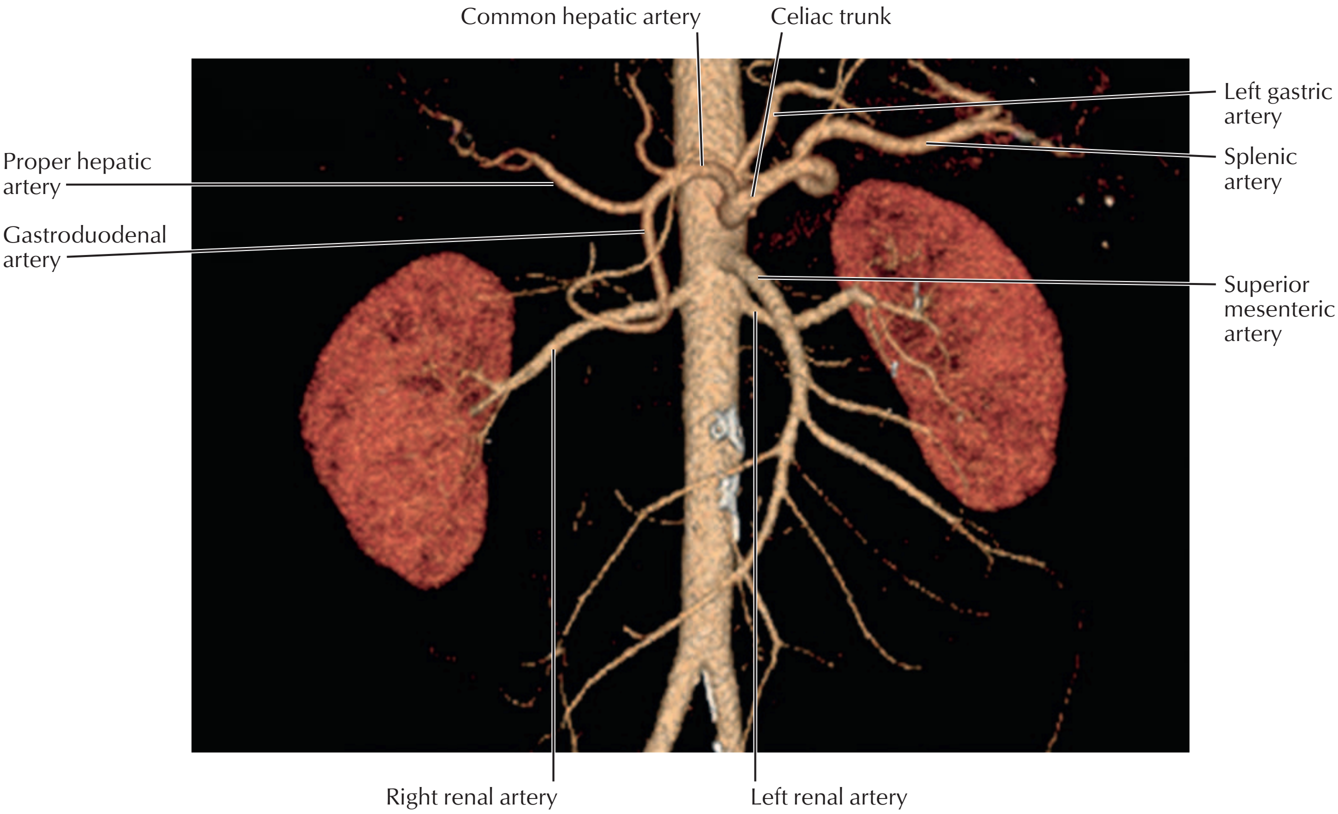
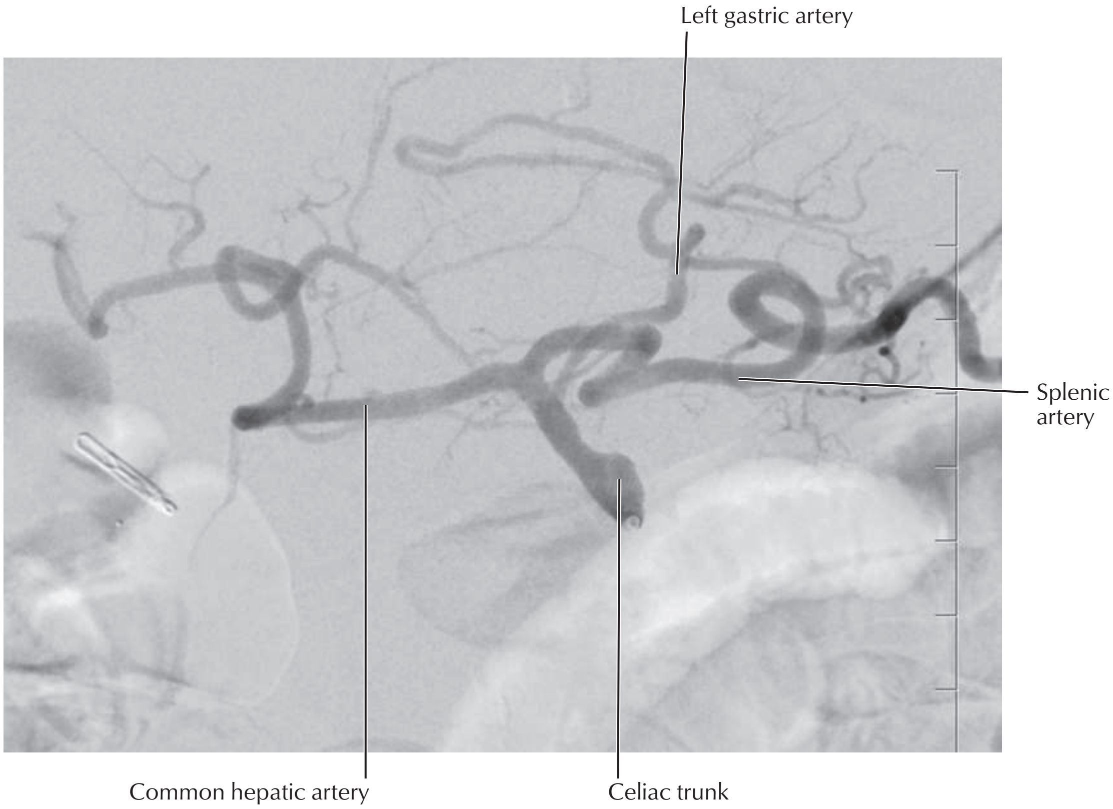
Celiac Arteriogram and CT Angiogram

See also Plates 290, 291

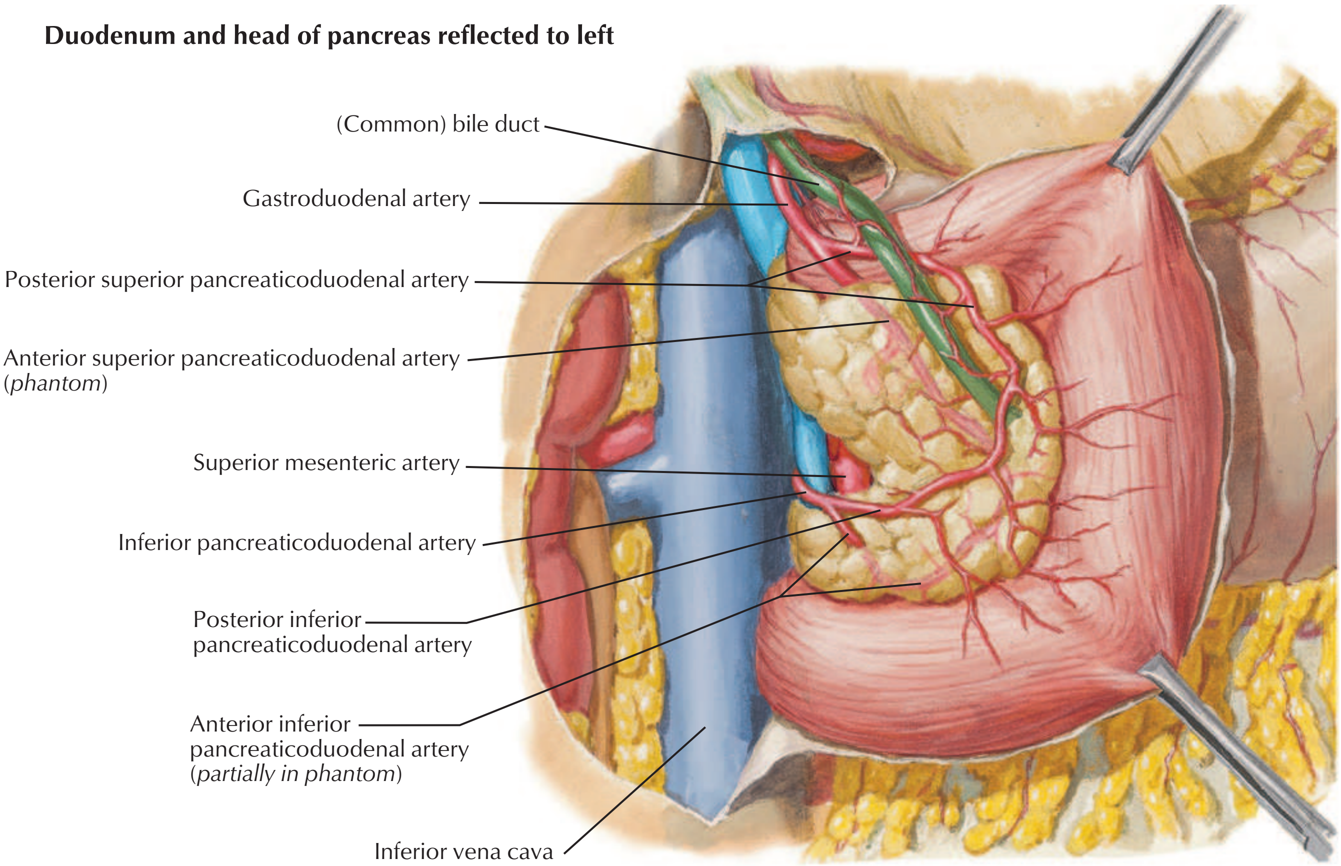
3D volume-rendered CT image with intravenous contrast enhancement

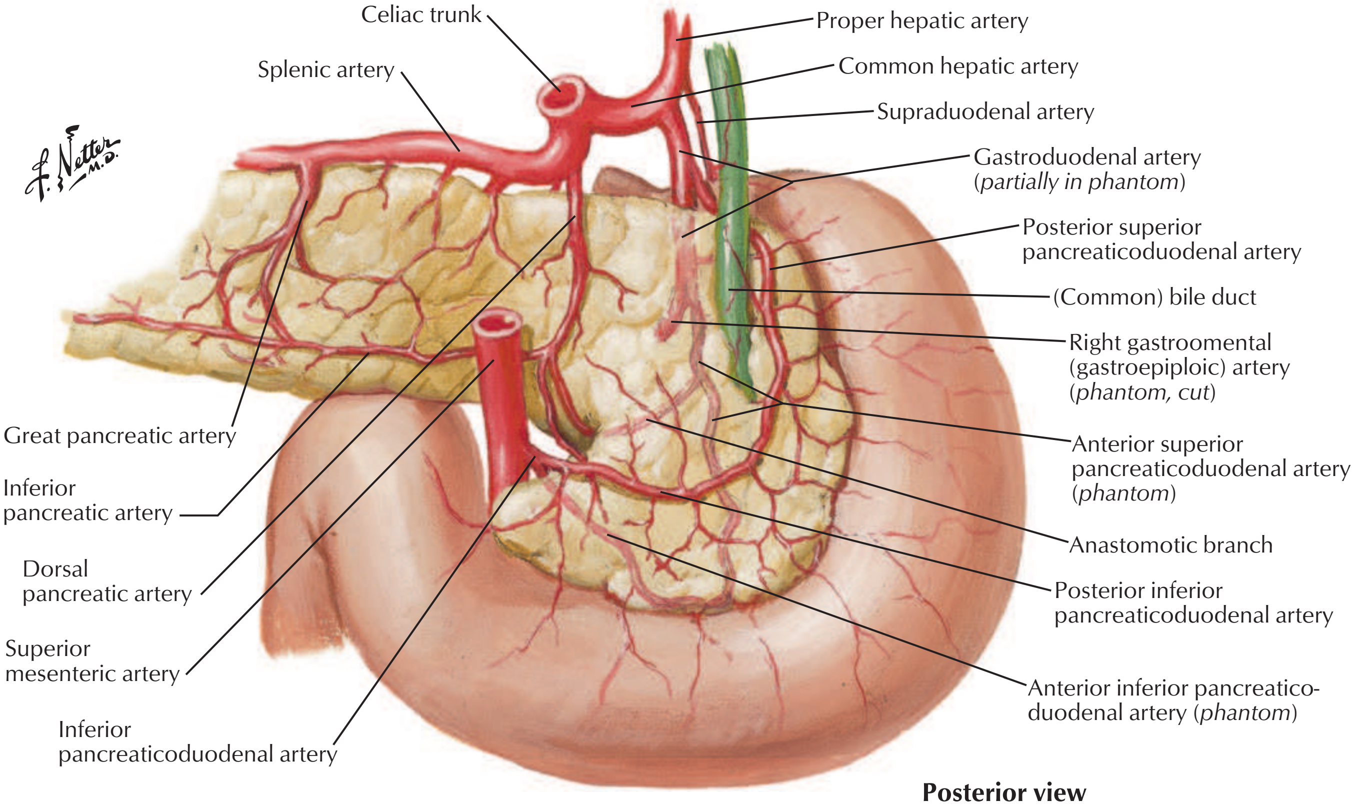

Common hepatic artery
Celiac trunk
Left gastric artery
Splenic artery
Proper hepatic artery
Gastroduodenal artery
Superior mesenteric artery
Right renal artery
Left renal artery

Selective digital subtraction angiogram, celiac trunk


Left gastric artery
Splenic artery
Common hepatic artery
Celiac trunk

Duodenum and head of pancreas reflected to left


(Common) bile duct
Gastroduodenal artery
Posterior superior pancreaticoduodenal artery
Anterior superior pancreaticoduodenal artery (*phantom*)
Superior mesenteric artery
Inferior pancreaticoduodenal artery
Posterior inferior pancreaticoduodenal artery
Anterior inferior pancreaticoduodenal artery (*partially in phantom*)
Inferior vena cava


Celiac trunk
Splenic artery
Proper hepatic artery
Common hepatic artery
Supraduodenal artery
Gastroduodenal artery (*partially in phantom*)
Posterior superior pancreaticoduodenal artery
(Common) bile duct
Right gastroomental (gastroepiploic) artery (*phantom, cut*)
Anterior superior pancreaticoduodenal artery (*phantom*)
Anastomotic branch
Posterior inferior pancreaticoduodenal artery
Anterior inferior pancreatico-duodenal artery (*phantom*)
Great pancreatic artery
Inferior pancreatic artery
Dorsal pancreatic artery
Superior mesenteric artery
Inferior pancreaticoduodenal artery
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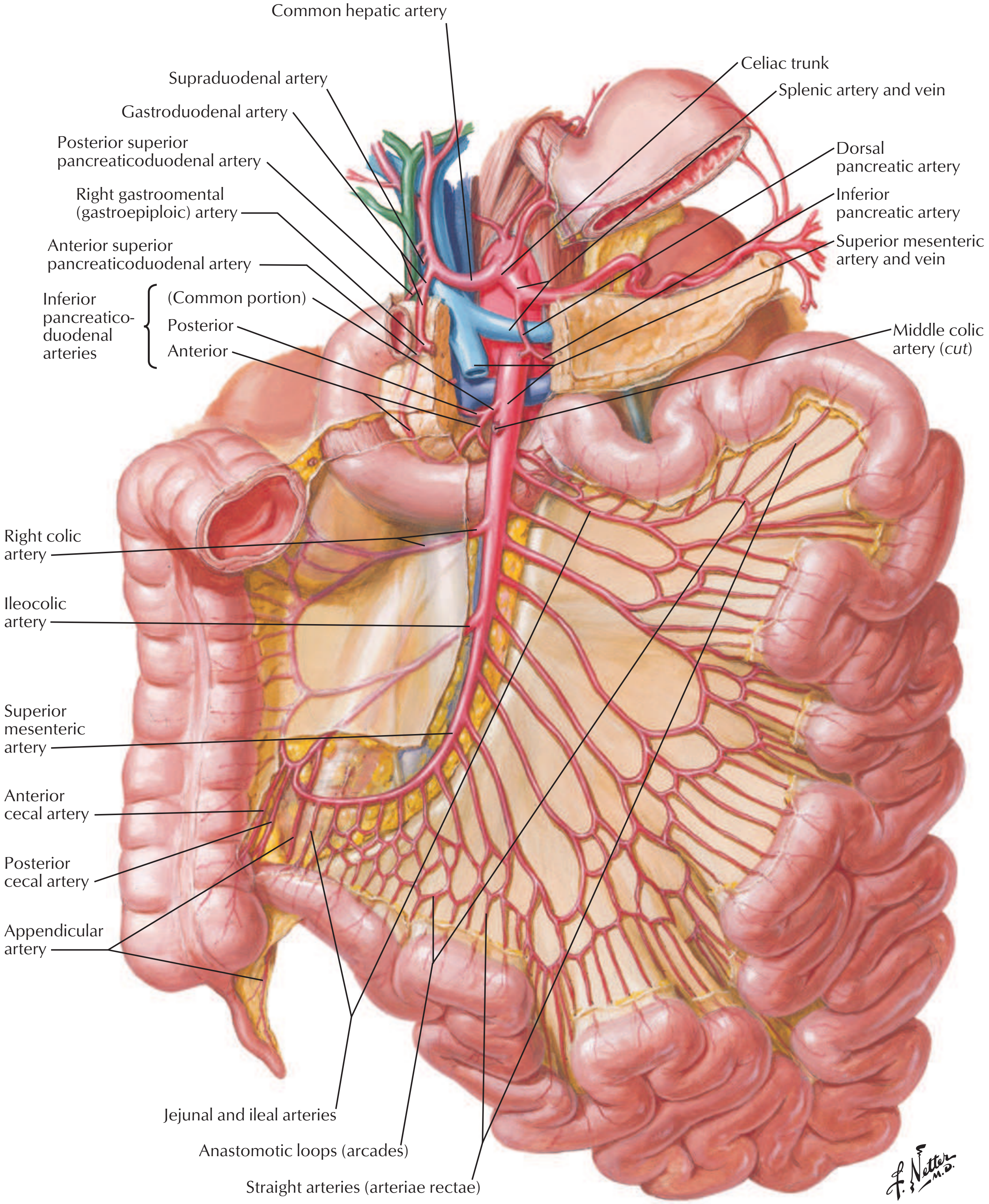
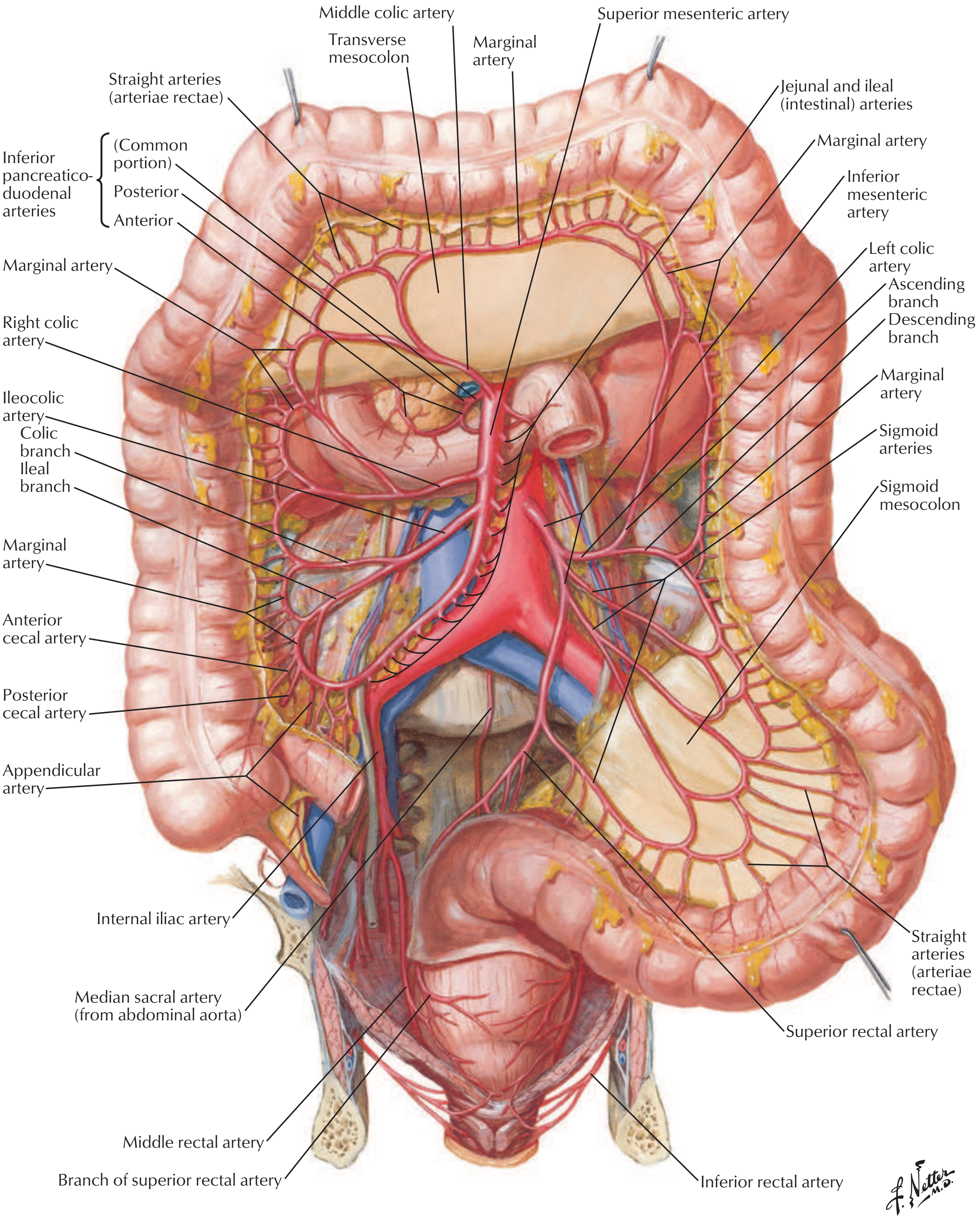
Posterior view


Common hepatic artery
Supraduodenal artery
Gastroduodenal artery
Posterior superior pancreaticoduodenal artery
Right gastroomental (gastroepiploic) artery
Anterior superior pancreaticoduodenal artery
Inferior pancreatico-duodenal arteries
(Common portion)
Posterior
Anterior
Celiac trunk
Splenic artery and vein
Dorsal pancreatic artery
Inferior pancreatic artery
Superior mesenteric artery and vein
Middle colic artery (cut)
Right colic artery
Ileocolic artery
Superior mesenteric artery
Anterior cecal artery
Posterior cecal artery
Appendicular artery
Jejunal and ileal arteries
Anastomotic loops (arcades)
Straight arteries (arteriae rectae)


Middle colic artery
Transverse mesocolon
Marginal artery
Superior mesenteric artery
Straight arteries (arteriae rectae)
Jejunal and ileal (intestinal) arteries
Inferior pancreatico-duodenal arteries
(Common portion)
Posterior
Anterior
Marginal artery
Inferior mesenteric artery
Marginal artery
Left colic artery
Ascending branch
Descending branch
Right colic artery
Marginal artery
Ileocolic artery
Colic branch
Ileal branch
Sigmoid arteries
Sigmoid mesocolon
Marginal artery
Anterior cecal artery
Posterior cecal artery
Appendicular artery
Internal iliac artery
Straight arteries (arteriae rectae)
Median sacral artery (from abdominal aorta)
Superior rectal artery
Middle rectal artery
Branch of superior rectal artery
Inferior rectal artery
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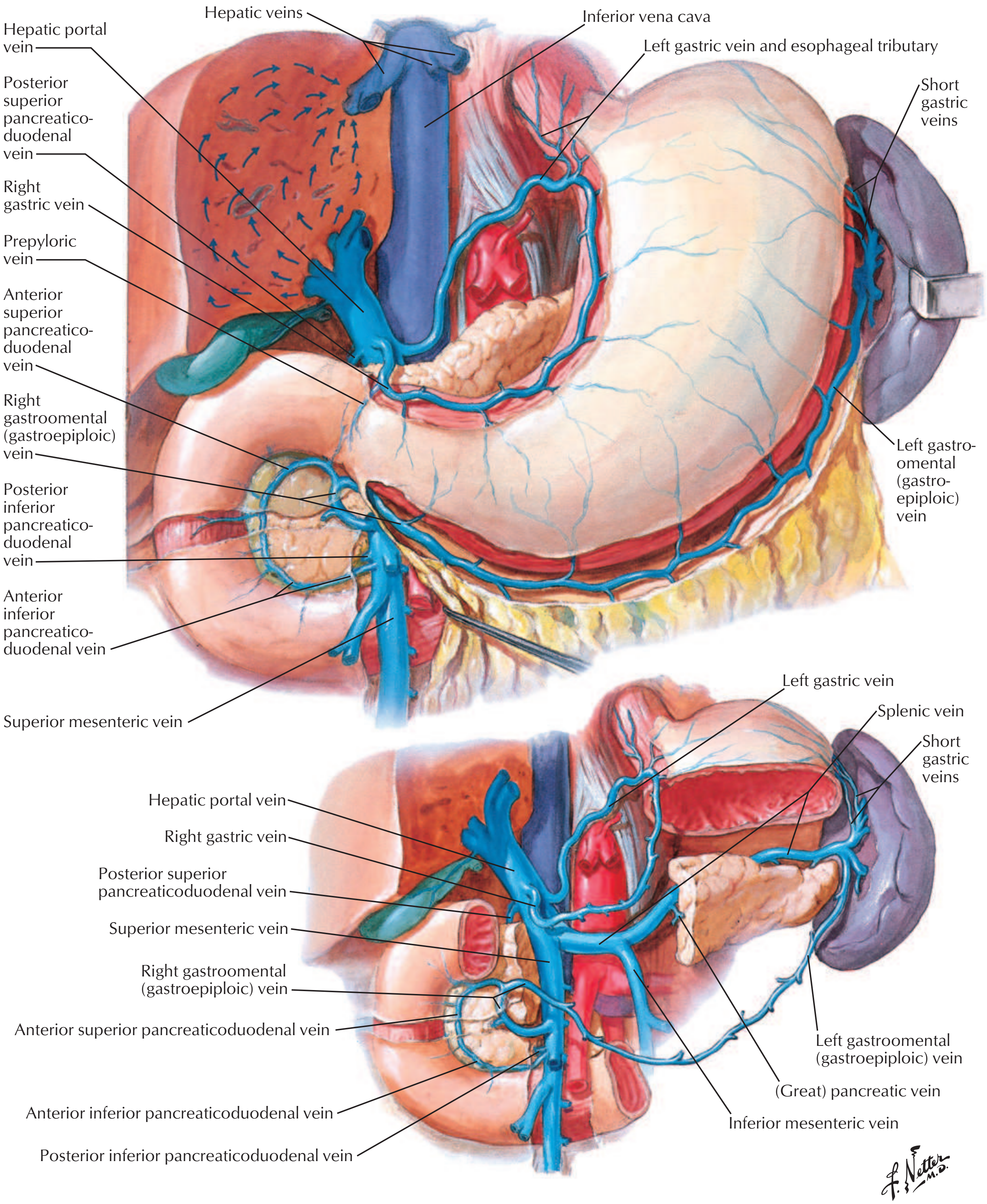
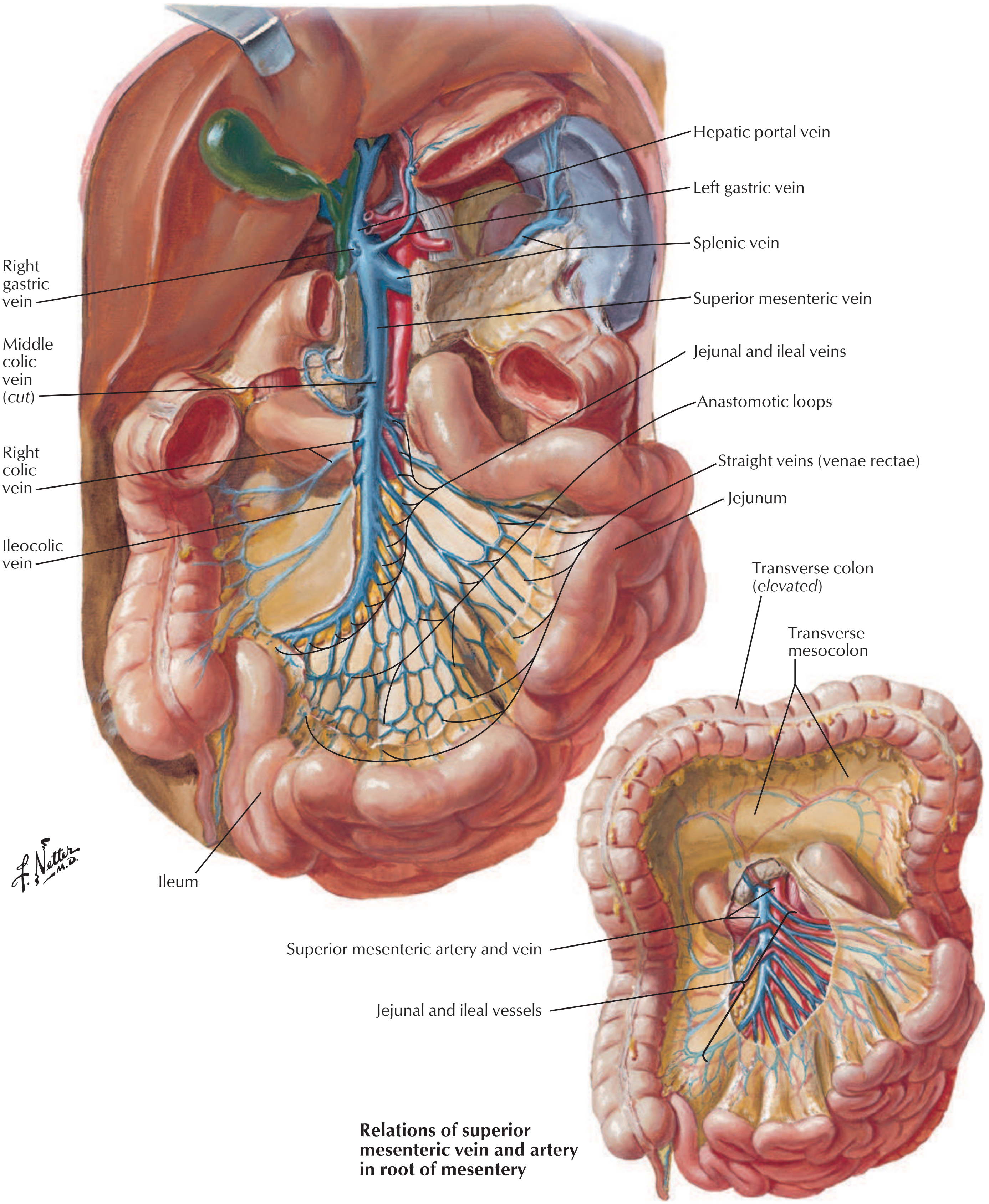
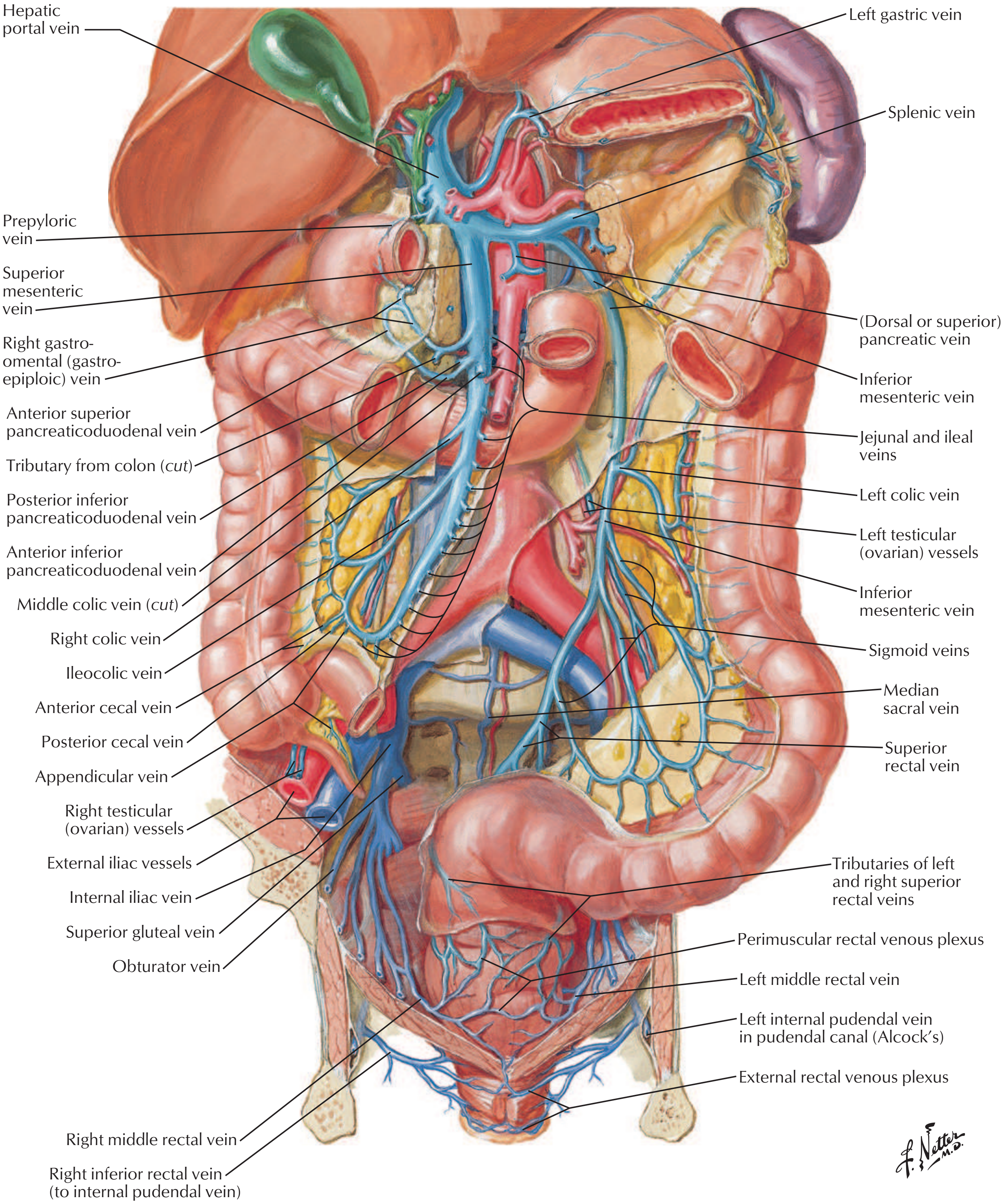
Veins of Stomach, Duodenum, Pancreas, and Spleen

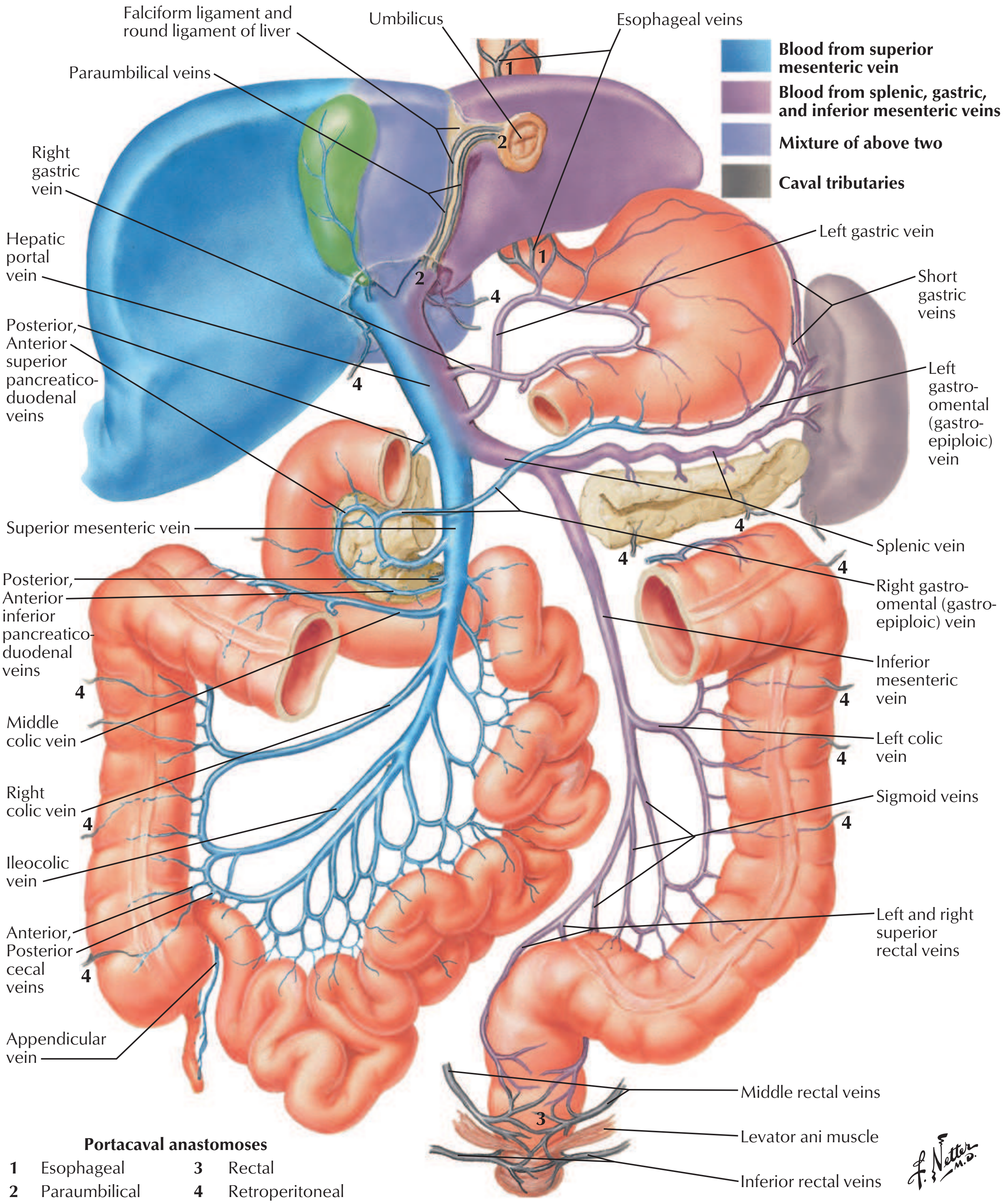


Hepatic veins
Inferior vena cava
Left gastric vein and esophageal tributary
Hepatic portal vein
Posterior superior pancreaticoduodenal vein
Short gastric veins
Right gastric vein
Prepyloric vein
Anterior superior pancreaticoduodenal vein
Right gastroomental (gastroepiploic) vein
Left gastro-omental (gastro-epiploic) vein
Posterior inferior pancreaticoduodenal vein
Anterior inferior pancreaticoduodenal vein
Superior mesenteric vein
Left gastric vein
Splenic vein
Short gastric veins
Hepatic portal vein
Right gastric vein
Posterior superior pancreaticoduodenal vein
Superior mesenteric vein
Right gastroomental (gastroepiploic) vein
Anterior superior pancreaticoduodenal vein
Left gastroomental (gastroepiploic) vein
(Great) pancreatic vein
Anterior inferior pancreaticoduodenal vein
Inferior mesenteric vein
Posterior inferior pancreaticoduodenal vein


Hepatic portal vein
Left gastric vein
Splenic vein
Superior mesenteric vein
Jejunal and ileal veins
Anastomotic loops
Straight veins (venae rectae)
Jejunum
Right gastric vein
Middle colic vein (*cut*)
Right colic vein
Ileocolic vein
Ileum
F. Netter M.D.
Transverse colon (*elevated*)
Transverse mesocolon
Superior mesenteric artery and vein
Jejunal and ileal vessels

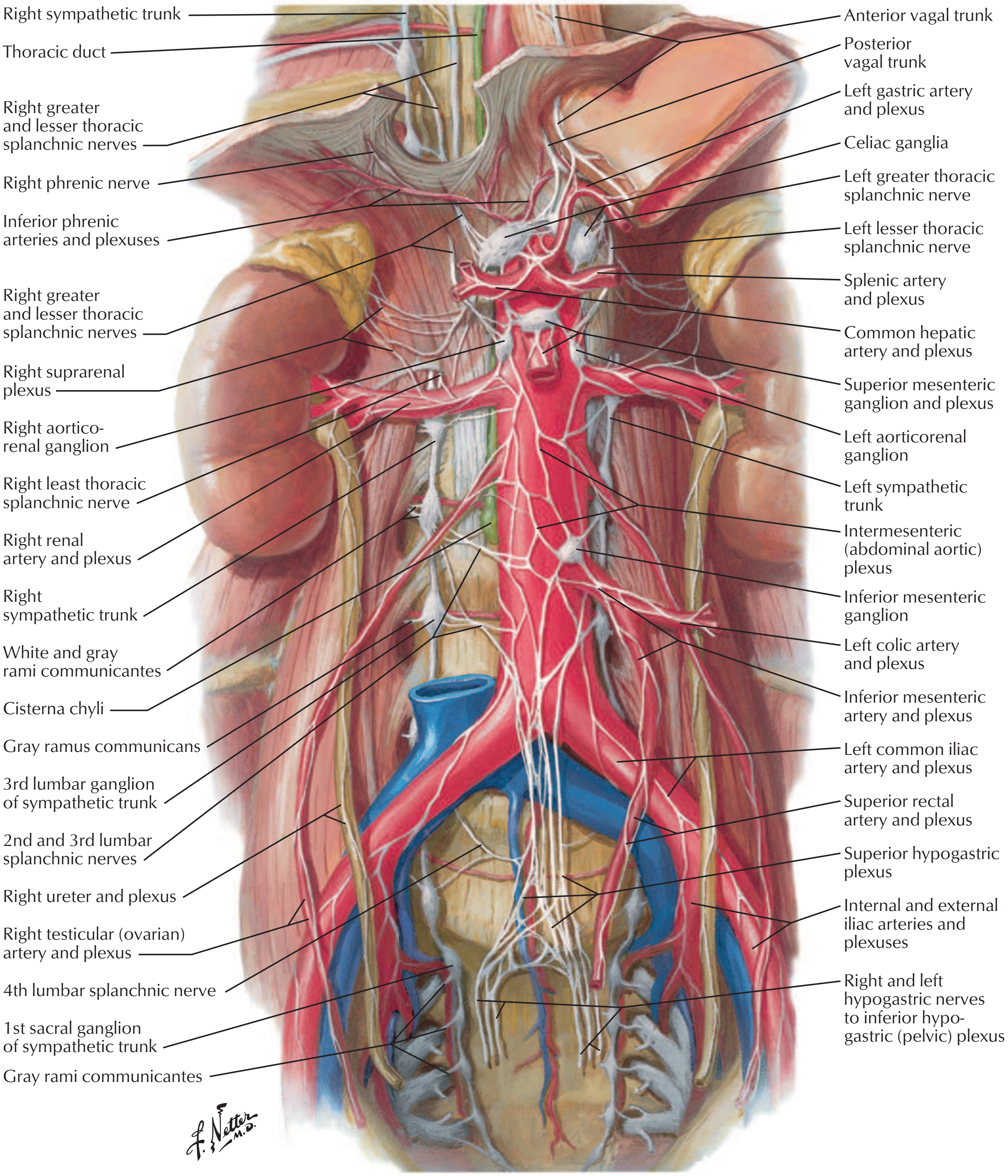
Relations of superior mesenteric vein and artery in root of mesentery


Hepatic portal vein
Prepyloric vein
Superior mesenteric vein
Right gastro-omental (gastroepiploic) vein
Anterior superior pancreaticoduodenal vein
Tributary from colon (cut)
Posterior inferior pancreaticoduodenal vein
Anterior inferior pancreaticoduodenal vein
Middle colic vein (cut)
Right colic vein
Ileocolic vein
Anterior cecal vein
Posterior cecal vein
Appendicular vein
Right testicular (ovarian) vessels
External iliac vessels
Internal iliac vein
Superior gluteal vein
Obturator vein
Right middle rectal vein
Right inferior rectal vein (to internal pudendal vein)
Left gastric vein
Splenic vein
(Dorsal or superior) pancreatic vein
Inferior mesenteric vein
Jejunal and ileal veins
Left colic vein
Left testicular (ovarian) vessels
Inferior mesenteric vein
Sigmoid veins
Median sacral vein
Superior rectal vein
Tributaries of left and right superior rectal veins
Perimuscular rectal venous plexus
Left middle rectal vein
Left internal pudendal vein in pudendal canal (Alcock's)
External rectal venous plexus
F. Netter M.D.

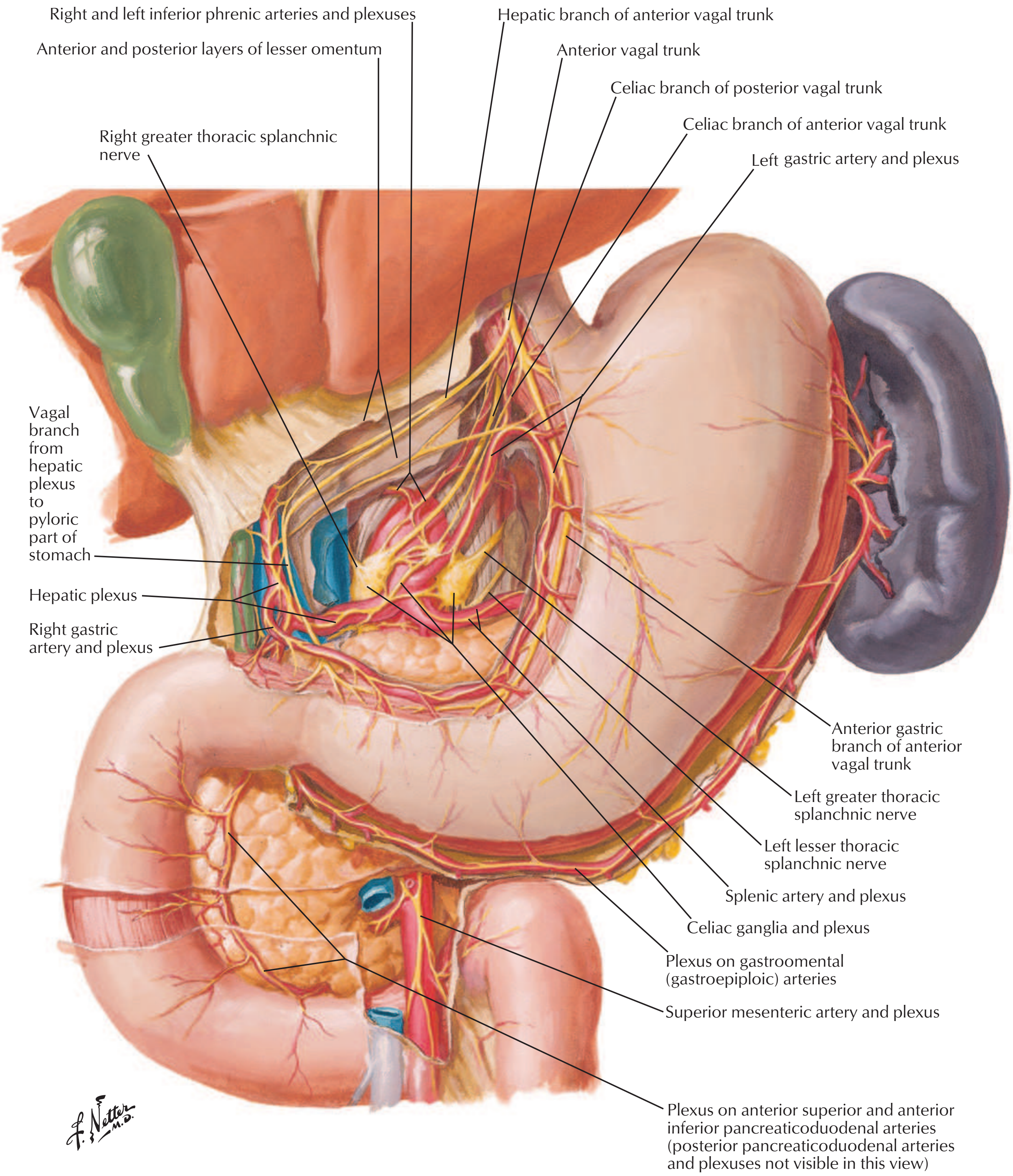

Falciform ligament and round ligament of liver
Umbilicus
Esophageal veins
Blood from superior mesenteric vein
Blood from splenic, gastric, and inferior mesenteric veins
Mixture of above two
Caval tributaries
Paraumbilical veins
Right gastric vein
Hepatic portal vein
Posterior, Anterior superior pancreaticoduodenal veins
Left gastric vein
Short gastric veins
Left gastro-omental (gastro-epiploic) vein
Superior mesenteric vein
Splenic vein
Posterior, Anterior inferior pancreaticoduodenal veins
Right gastro-omental (gastro-epiploic) vein
Inferior mesenteric vein
Middle colic vein
Left colic vein
Right colic vein
Sigmoid veins
Ileocolic vein
Anterior, Posterior cecal veins
Left and right superior rectal veins
Appendicular vein
Middle rectal veins
Levator ani muscle
Inferior rectal veins
1
2
3
4
Portacaval anastomoses
1 Esophageal
2 Paraumbilical
3 Rectal
4 Retroperitoneal
F. Netter M.D.

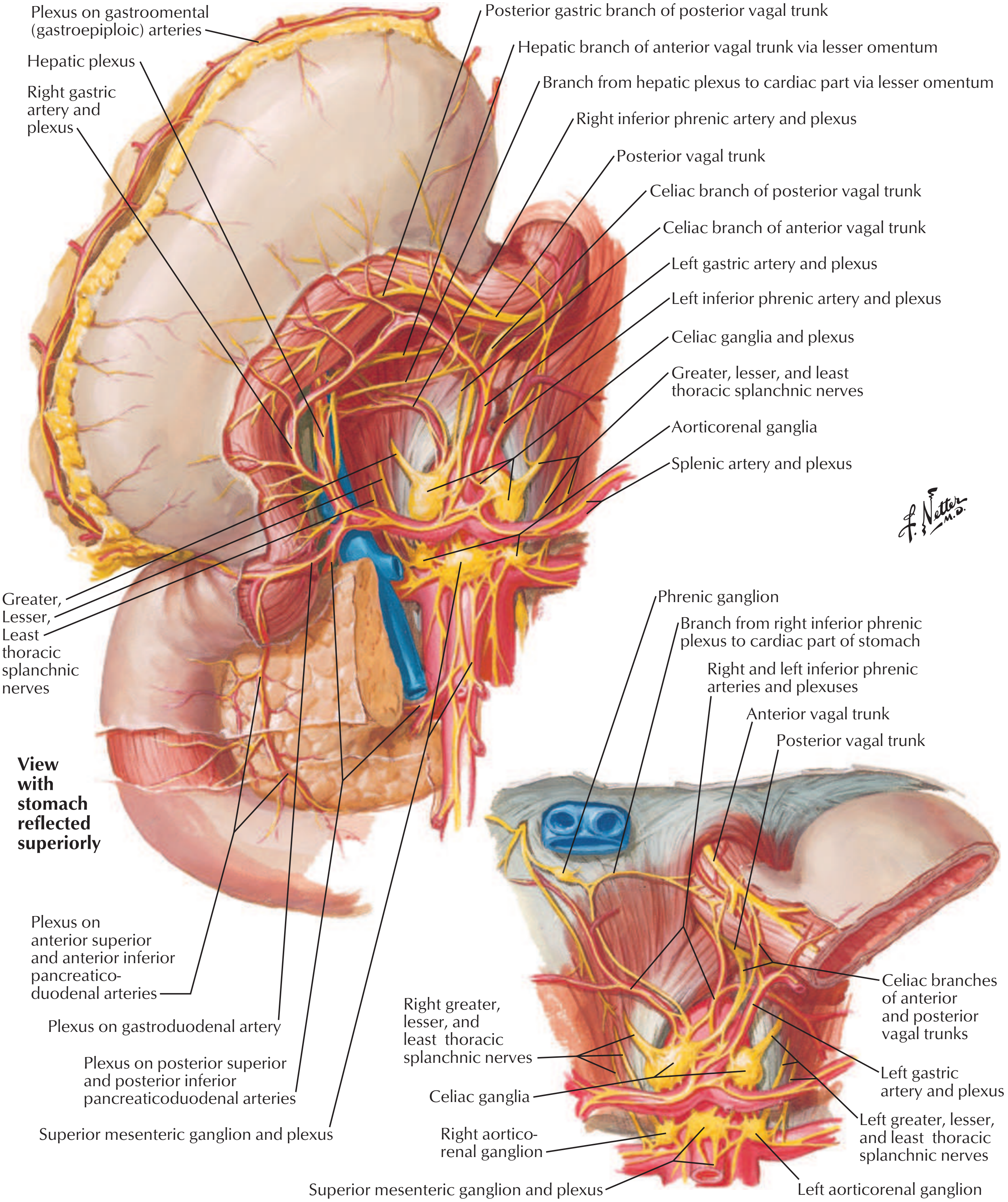
Autonomic Nerves and Ganglia

See also **Plate 305**


Right sympathetic trunk
Thoracic duct
Right greater and lesser thoracic splanchnic nerves
Right phrenic nerve
Inferior phrenic arteries and plexuses
Right greater and lesser thoracic splanchnic nerves
Right suprarenal plexus
Right aortico-renal ganglion
Right least thoracic splanchnic nerve
Right renal artery and plexus
Right sympathetic trunk
White and gray rami communicantes
Cisterna chyli
Gray ramus communicans
3rd lumbar ganglion of sympathetic trunk
2nd and 3rd lumbar splanchnic nerves
Right ureter and plexus
Right testicular (ovarian) artery and plexus
4th lumbar splanchnic nerve
1st sacral ganglion of sympathetic trunk
Gray rami communicantes
Anterior vagal trunk
Posterior vagal trunk
Left gastric artery and plexus
Celiac ganglia
Left greater thoracic splanchnic nerve
Left lesser thoracic splanchnic nerve
Splenic artery and plexus
Common hepatic artery and plexus
Superior mesenteric ganglion and plexus
Left aorticorenal ganglion
Left sympathetic trunk
Intermesenteric (abdominal aortic) plexus
Inferior mesenteric ganglion
Left colic artery and plexus
Inferior mesenteric artery and plexus
Left common iliac artery and plexus
Superior rectal artery and plexus
Superior hypogastric plexus
Internal and external iliac arteries and plexuses
Right and left hypogastric nerves to inferior hypo-gastric (pelvic) plexus
F. Netter M.D.

See also Plate 243


Right and left inferior phrenic arteries and plexuses
Anterior and posterior layers of lesser omentum
Right greater thoracic splanchnic nerve
Hepatic branch of anterior vagal trunk
Anterior vagal trunk
Celiac branch of posterior vagal trunk
Celiac branch of anterior vagal trunk
Left gastric artery and plexus
Vagal branch from hepatic plexus to pyloric part of stomach
Hepatic plexus
Right gastric artery and plexus
Anterior gastric branch of anterior vagal trunk
Left greater thoracic splanchnic nerve
Left lesser thoracic splanchnic nerve
Splenic artery and plexus
Celiac ganglia and plexus
Plexus on gastroomental (gastroepiploic) arteries
Superior mesenteric artery and plexus
Plexus on anterior superior and anterior inferior pancreaticoduodenal arteries (posterior pancreaticoduodenal arteries and plexuses not visible in this view)
F. Netter M.D.

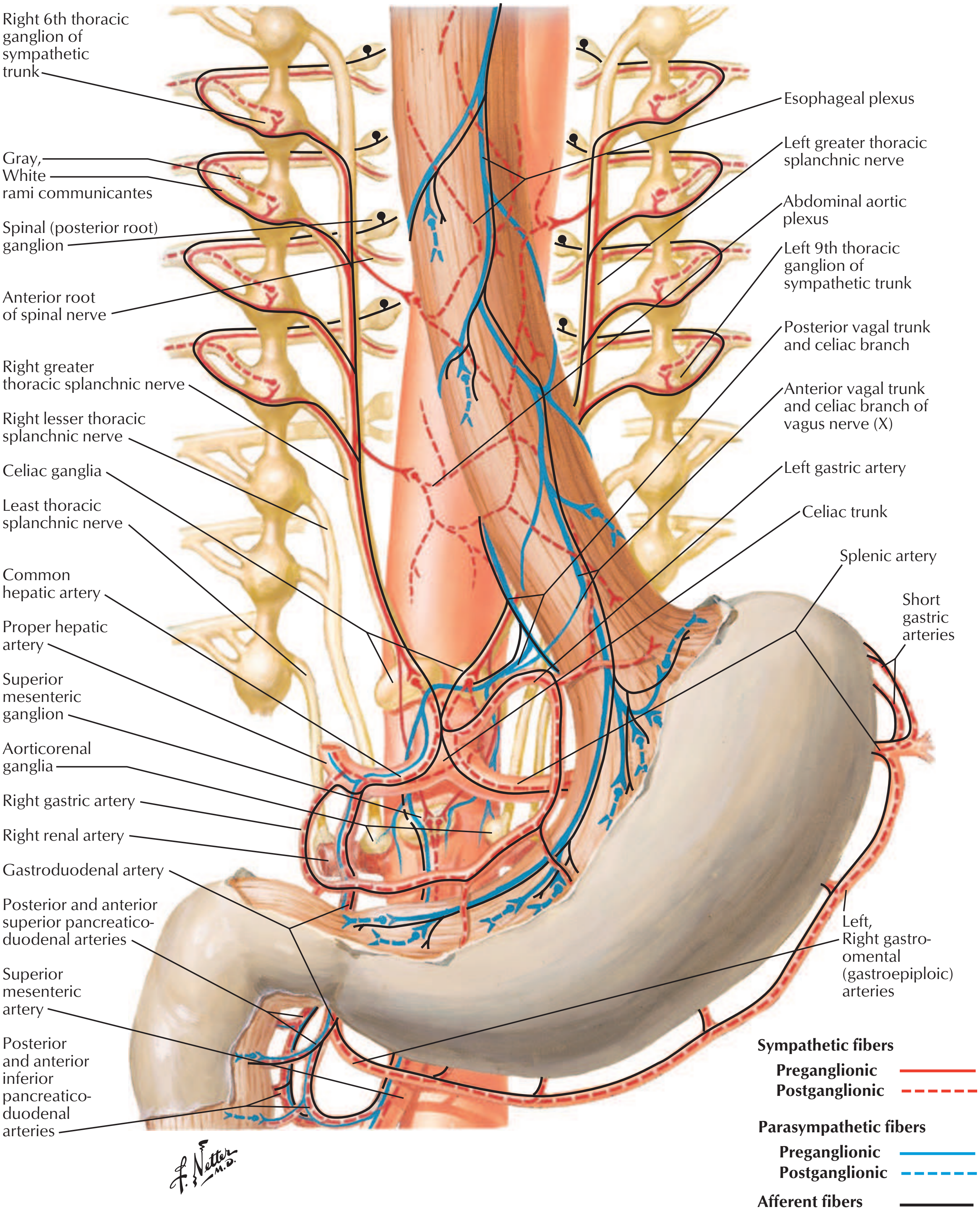

Plexus on gastroomental (gastroepiploic) arteries
Hepatic plexus
Right gastric artery and plexus
Posterior gastric branch of posterior vagal trunk
Hepatic branch of anterior vagal trunk via lesser omentum
Branch from hepatic plexus to cardiac part via lesser omentum
Right inferior phrenic artery and plexus
Posterior vagal trunk
Celiac branch of posterior vagal trunk
Celiac branch of anterior vagal trunk
Left gastric artery and plexus
Left inferior phrenic artery and plexus
Celiac ganglia and plexus
Greater, lesser, and least thoracic splanchnic nerves
Aorticorenal ganglia
Splenic artery and plexus
Greater, Lesser, Least thoracic splanchnic nerves
Plexus on anterior superior and anterior inferior pancreaticoduodenal arteries
Plexus on gastroduodenal artery
Plexus on posterior superior and posterior inferior pancreaticoduodenal arteries
Superior mesenteric ganglion and plexus

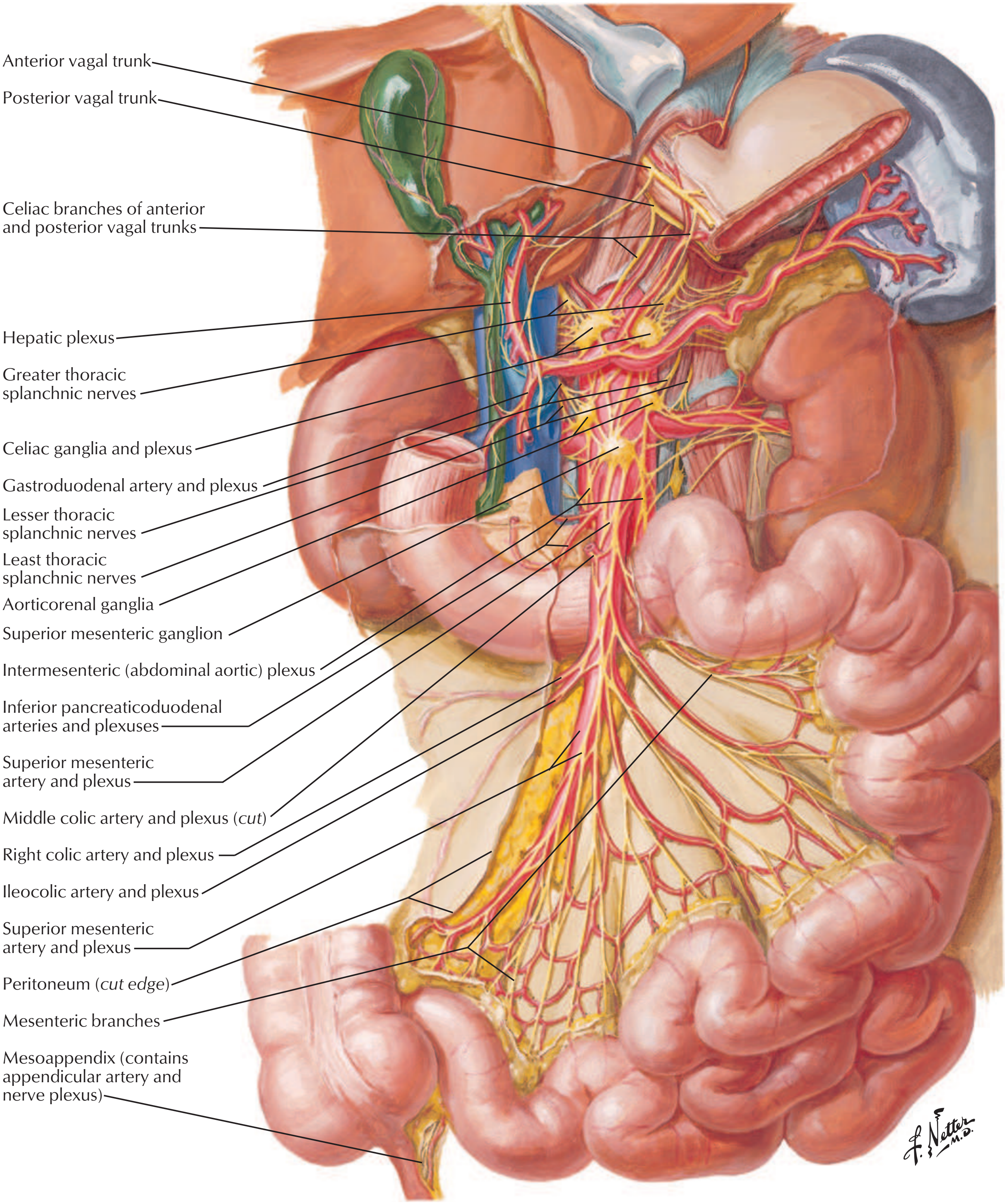
View with stomach reflected superiorly

Phrenic ganglion
Branch from right inferior phrenic plexus to cardiac part of stomach
Right and left inferior phrenic arteries and plexuses
Anterior vagal trunk
Posterior vagal trunk
Celiac branches of anterior and posterior vagal trunks
Left gastric artery and plexus
Left greater, lesser, and least thoracic splanchnic nerves
Left aorticorenal ganglion
Right greater, lesser, and least thoracic splanchnic nerves
Celiac ganglia
Right aortico-renal ganglion
Superior mesenteric ganglion and plexus

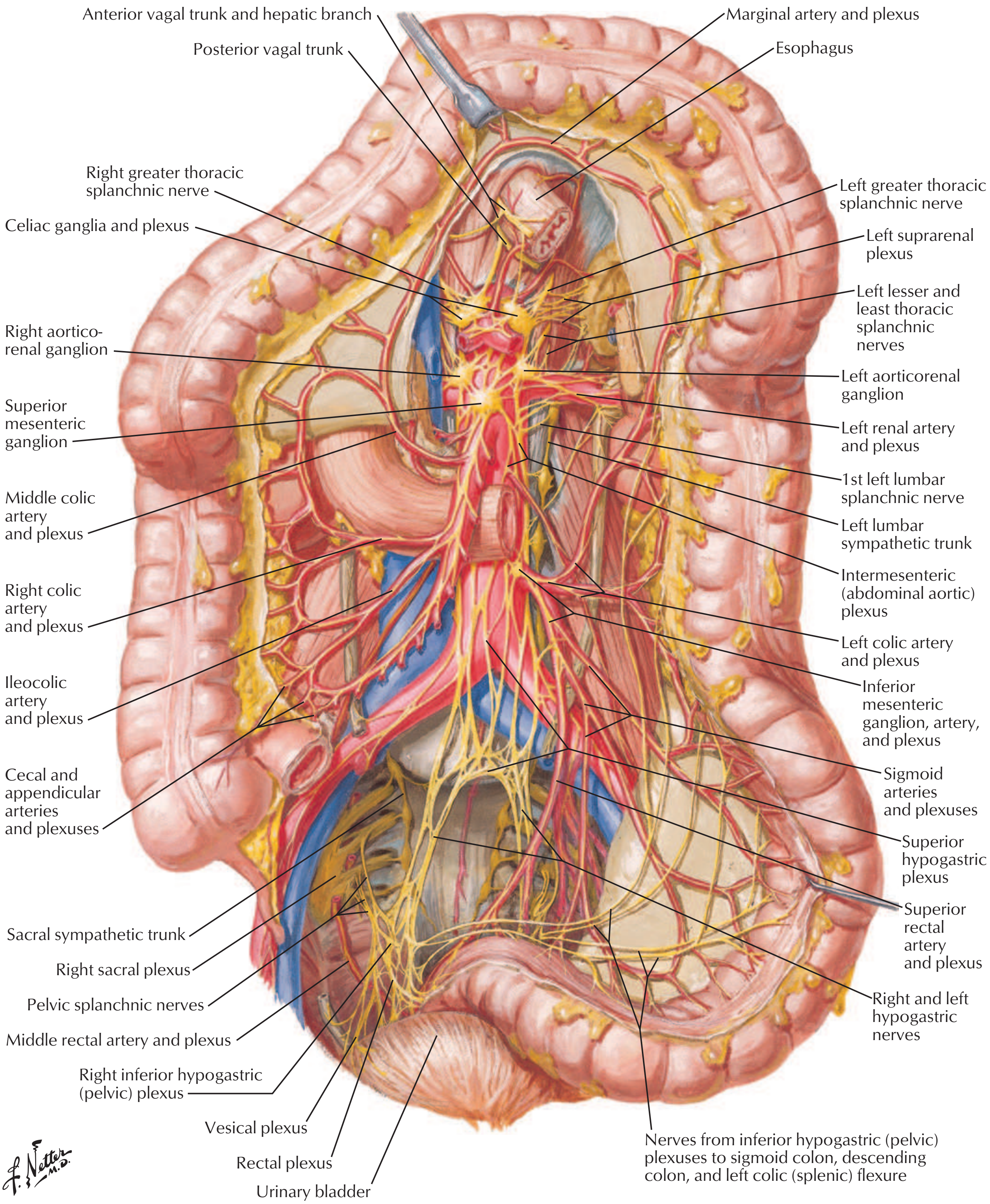
Autonomic Innervation of Esophagus, Stomach, and Duodenum: Schema

See also Plates 172, 173


Right 6th thoracic ganglion of sympathetic trunk
Gray,
White
rami communicantes
Spinal (posterior root) ganglion
Anterior root of spinal nerve
Right greater thoracic splanchnic nerve
Right lesser thoracic splanchnic nerve
Celiac ganglia
Least thoracic splanchnic nerve
Common hepatic artery
Proper hepatic artery
Superior mesenteric ganglion
Aorticorenal ganglia
Right gastric artery
Right renal artery
Gastroduodenal artery
Posterior and anterior superior pancreaticoduodenal arteries
Superior mesenteric artery
Posterior and anterior inferior pancreaticoduodenal arteries
Esophageal plexus
Left greater thoracic splanchnic nerve
Abdominal aortic plexus
Left 9th thoracic ganglion of sympathetic trunk
Posterior vagal trunk and celiac branch
Anterior vagal trunk and celiac branch of vagus nerve (X)
Left gastric artery
Celiac trunk
Splenic artery
Short gastric arteries
Left,
Right gastro-omental (gastroepiploic) arteries
Sympathetic fibers
Preganglionic
Postganglionic
Parasympathetic fibers
Preganglionic
Postganglionic
Afferent fibers
F. Netter M.D.

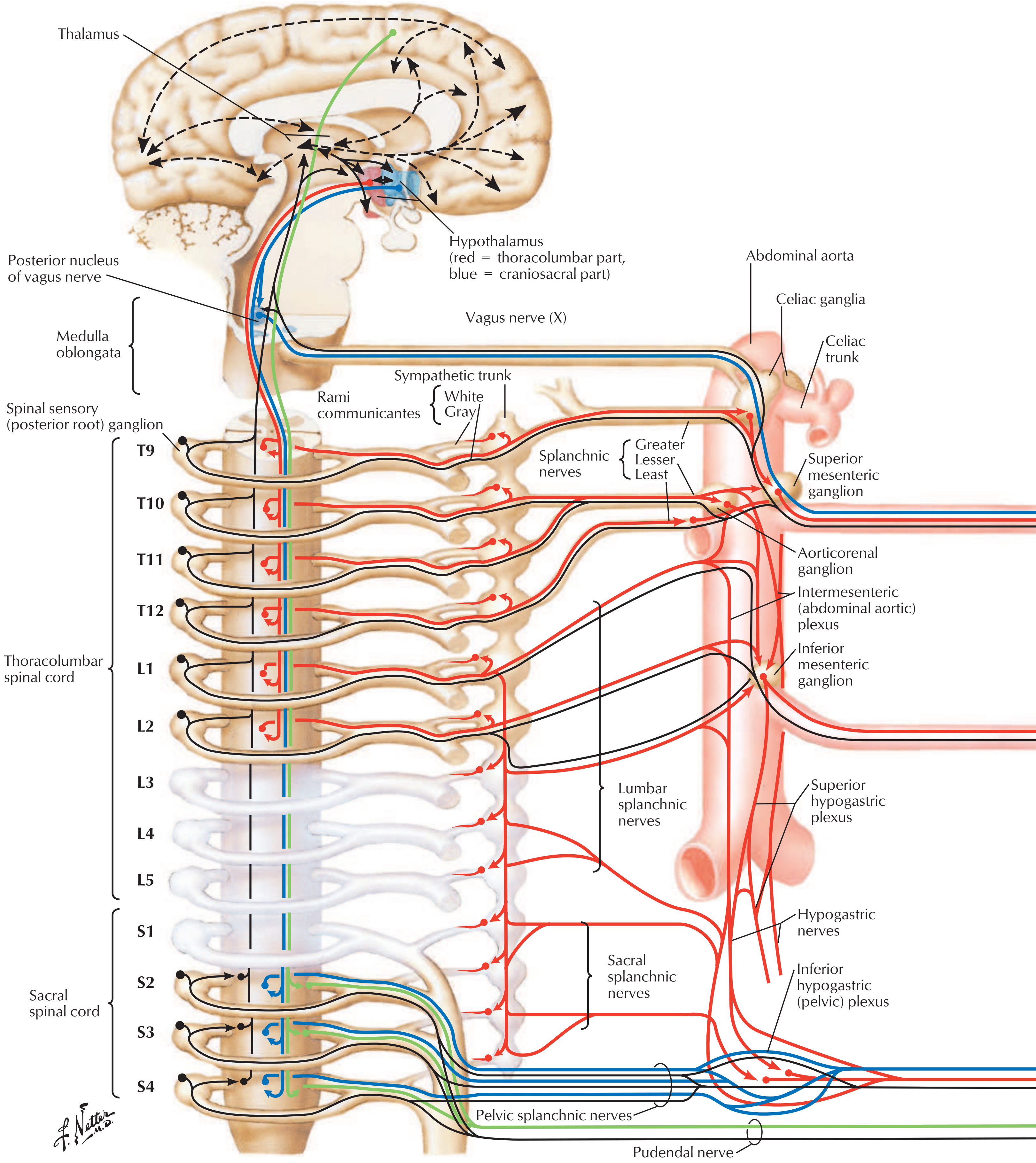

Anterior vagal trunk
Posterior vagal trunk
Celiac branches of anterior and posterior vagal trunks
Hepatic plexus
Greater thoracic splanchnic nerves
Celiac ganglia and plexus
Gastroduodenal artery and plexus
Lesser thoracic splanchnic nerves
Least thoracic splanchnic nerves
Aorticorenal ganglia
Superior mesenteric ganglion
Intermesenteric (abdominal aortic) plexus
Inferior pancreaticoduodenal arteries and plexuses
Superior mesenteric artery and plexus
Middle colic artery and plexus (*cut*)
Right colic artery and plexus
Ileocolic artery and plexus
Superior mesenteric artery and plexus
Peritoneum (*cut edge*)
Mesenteric branches
Mesoappendix (contains appendicular artery and nerve plexus)
F. Netter M.D.

See also Plates 392, 393, 394


Anterior vagal trunk and hepatic branch
Posterior vagal trunk
Marginal artery and plexus
Esophagus
Right greater thoracic splanchnic nerve
Celiac ganglia and plexus
Left greater thoracic splanchnic nerve
Left suprarenal plexus
Left lesser and least thoracic splanchnic nerves
Right aortico-renal ganglion
Left aorticorenal ganglion
Superior mesenteric ganglion
Left renal artery and plexus
1st left lumbar splanchnic nerve
Middle colic artery and plexus
Left lumbar sympathetic trunk
Intermesenteric (abdominal aortic) plexus
Right colic artery and plexus
Left colic artery and plexus
Ileocolic artery and plexus
Inferior mesenteric ganglion, artery, and plexus
Cecal and appendicular arteries and plexuses
Sigmoid arteries and plexuses
Superior hypogastric plexus
Superior rectal artery and plexus
Sacral sympathetic trunk
Right sacral plexus
Pelvic splanchnic nerves
Right and left hypogastric nerves
Middle rectal artery and plexus
Right inferior hypogastric (pelvic) plexus
Vesical plexus
Rectal plexus
Urinary bladder
Nerves from inferior hypogastric (pelvic) plexuses to sigmoid colon, descending colon, and left colic (splenic) flexure
F. Netter M.D.

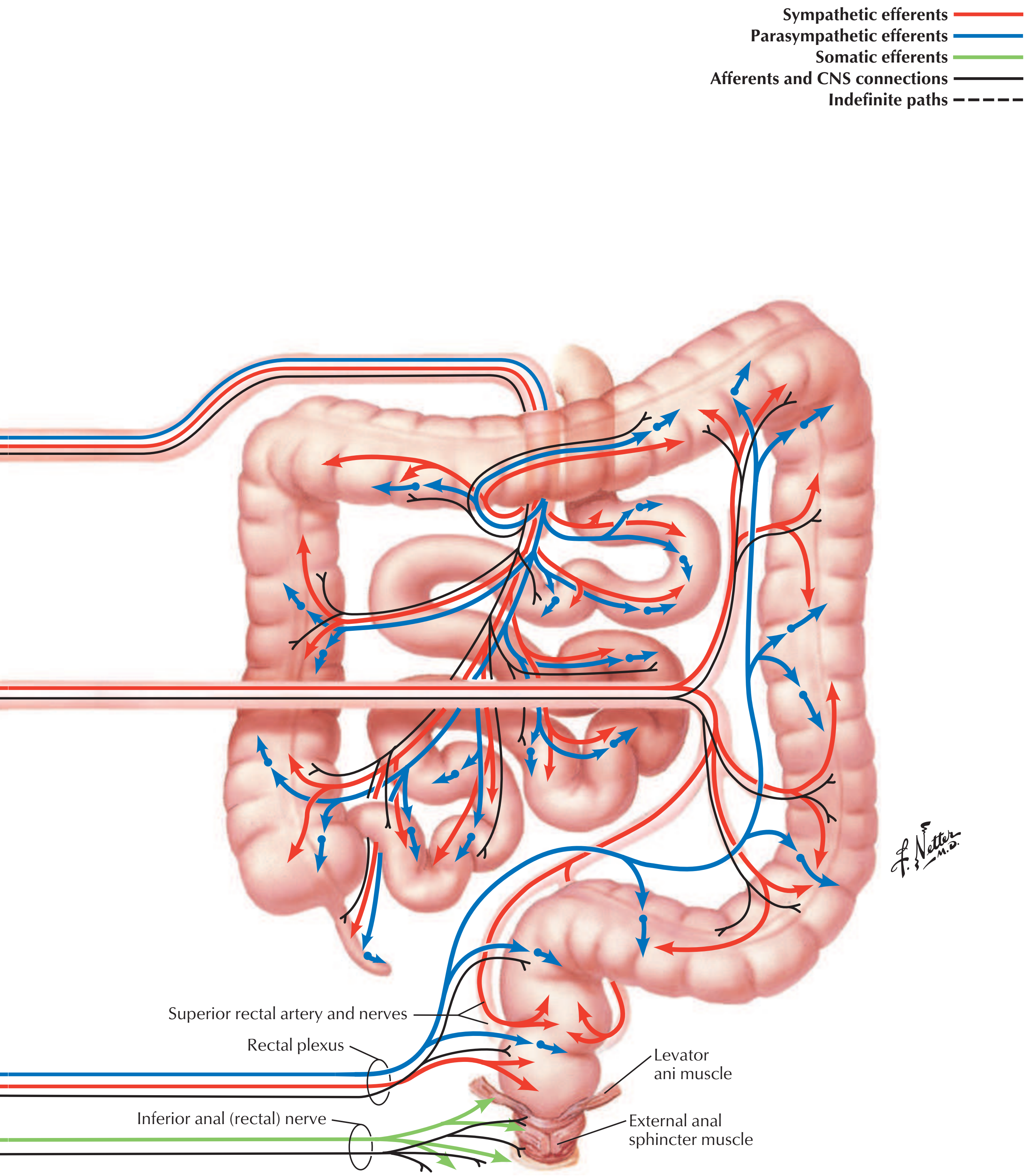
Autonomic Innervation of Intestines: Schema

See also **Plates 172, 173**

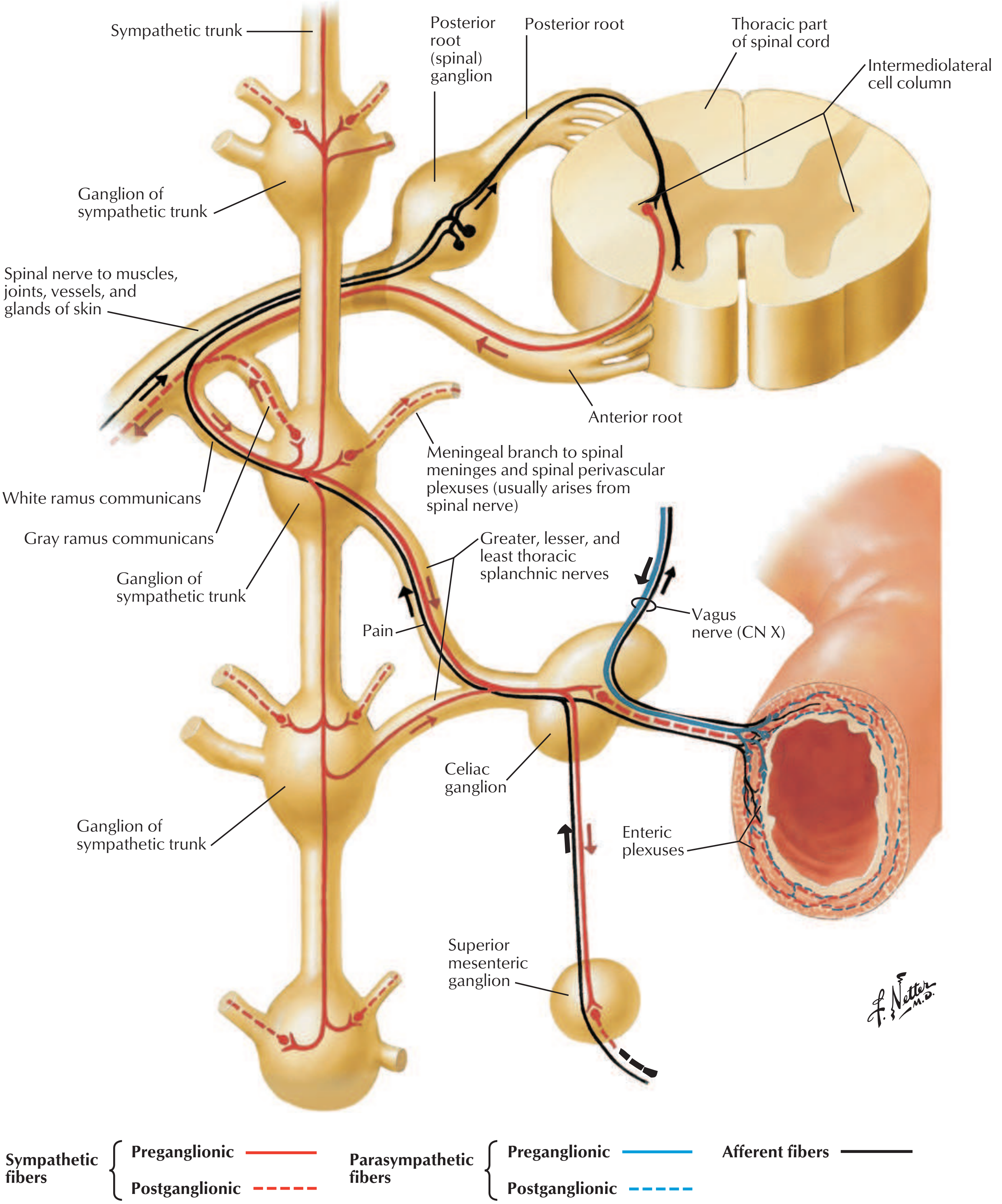

Thalamus
Hypothalamus
(red = thoracolumbar part,
blue = craniosacral part)
Posterior nucleus
of vagus nerve
Medulla
oblongata
Vagus nerve (X)
Abdominal aorta
Celiac ganglia
Celiac
trunk
Sympathetic trunk
Rami
communicantes
White
Gray
Spinal sensory
(posterior root) ganglion
T9
T10
T11
T12
L1
L2
L3
L4
L5
S1
S2
S3
S4
Splanchnic
nerves
Greater
Lesser
Least
Superior
mesenteric
ganglion
Aorticorenal
ganglion
Intermesenteric
(abdominal aortic)
plexus
Inferior
mesenteric
ganglion
Thoracolumbar
spinal cord
Lumbar
splanchnic
nerves
Superior
hypogastric
plexus
Hypogastric
nerves
Sacral
splanchnic
nerves
Inferior
hypogastric
(pelvic) plexus
Sacral
spinal cord
Pelvic splanchnic nerves
Pudendal nerve
F. Netter M.D.

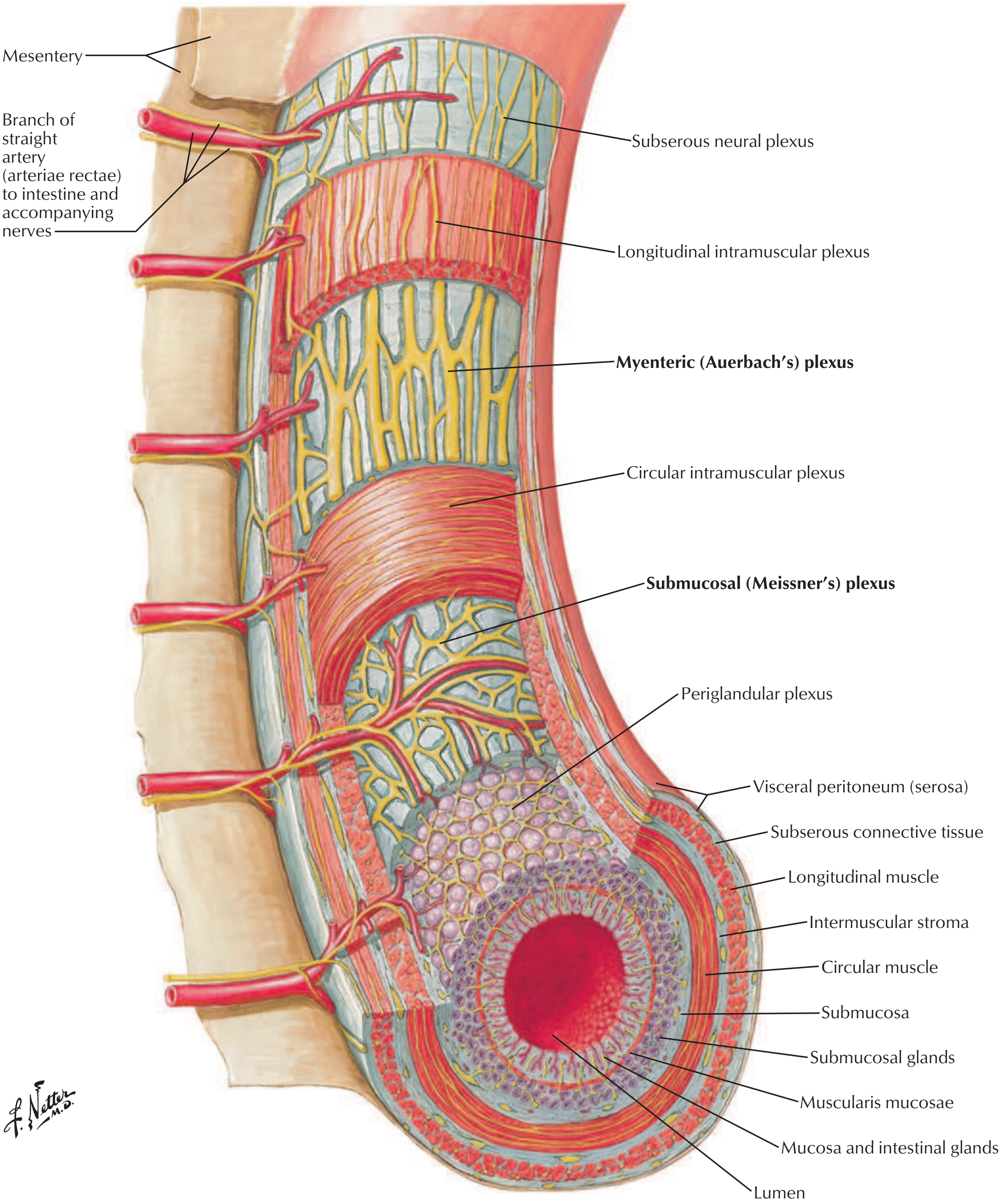
Autonomic Innervation of Intestines: Schema (continued)

See also **Plates 172, 173**


Sympathetic efferents
Parasympathetic efferents
Somatic efferents
Afferents and CNS connections
Indefinite paths
Superior rectal artery and nerves
Rectal plexus
Levator ani muscle
Inferior anal (rectal) nerve
External anal sphincter muscle

Autonomic Reflex Pathways: Schema

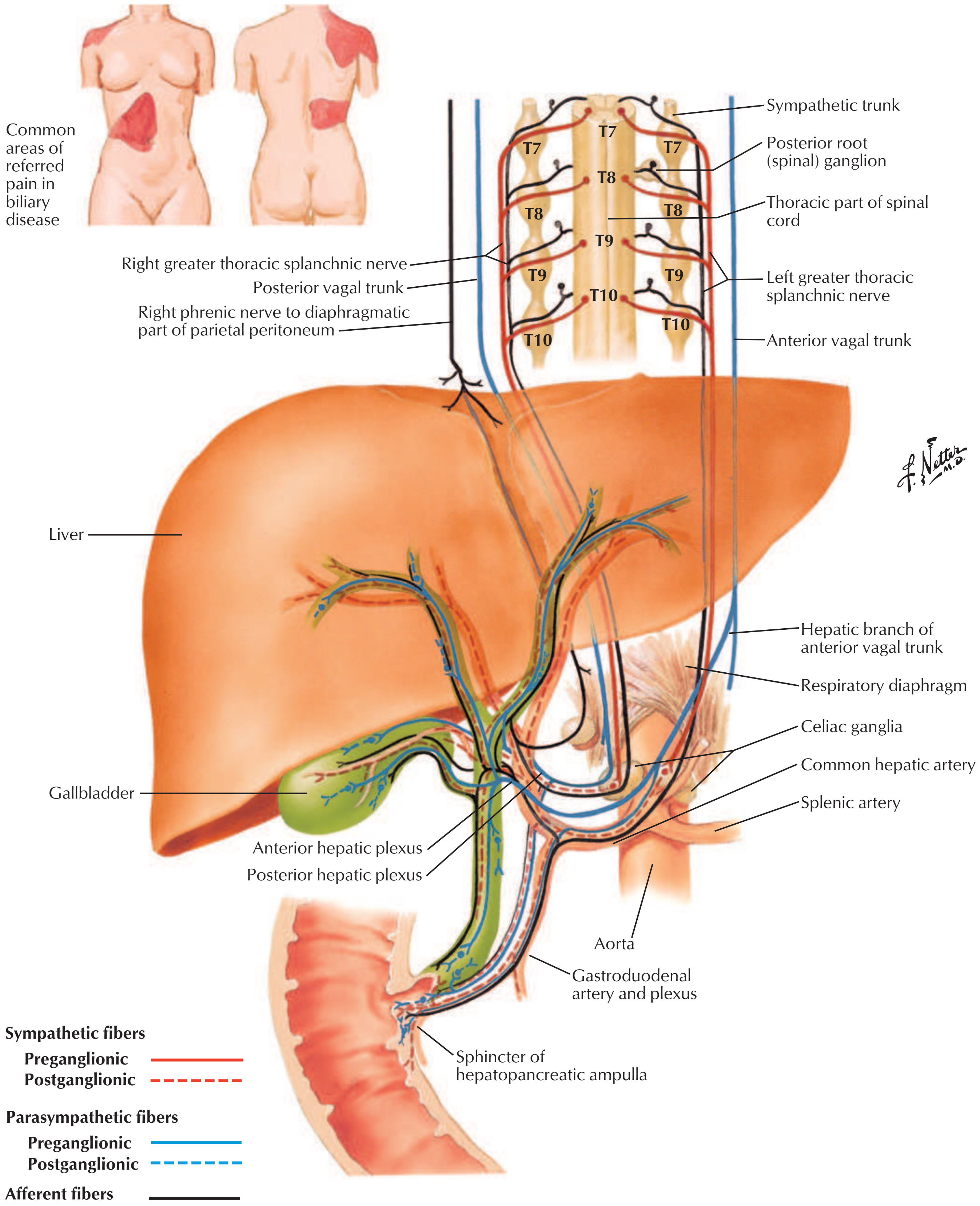

Sympathetic trunk
Posterior root (spinal) ganglion
Posterior root
Thoracic part of spinal cord
Intermediolateral cell column
Ganglion of sympathetic trunk
Spinal nerve to muscles, joints, vessels, and glands of skin
Anterior root
Meningeal branch to spinal meninges and spinal perivascular plexuses (usually arises from spinal nerve)
White ramus communicans
Gray ramus communicans
Ganglion of sympathetic trunk
Greater, lesser, and least thoracic splanchnic nerves
Pain
Vagus nerve (CN X)
Celiac ganglion
Ganglion of sympathetic trunk
Enteric plexuses
Superior mesenteric ganglion
Sympathetic fibers
Preganglionic
Postganglionic
Parasympathetic fibers
Preganglionic
Postganglionic
Afferent fibers


Mesentery
Branch of straight artery (arteriae rectae) to intestine and accompanying nerves
Subserous neural plexus
Longitudinal intramuscular plexus
Myenteric (Auerbach's) plexus
Circular intramuscular plexus
Submucosal (Meissner's) plexus
Periglandular plexus
Visceral peritoneum (serosa)
Subserous connective tissue
Longitudinal muscle
Intermuscular stroma
Circular muscle
Submucosa
Submucosal glands
Muscularis mucosae
Mucosa and intestinal glands
Lumen
F. Netter M.D.

Note: Intestinal wall is shown much thicker than in actuality.

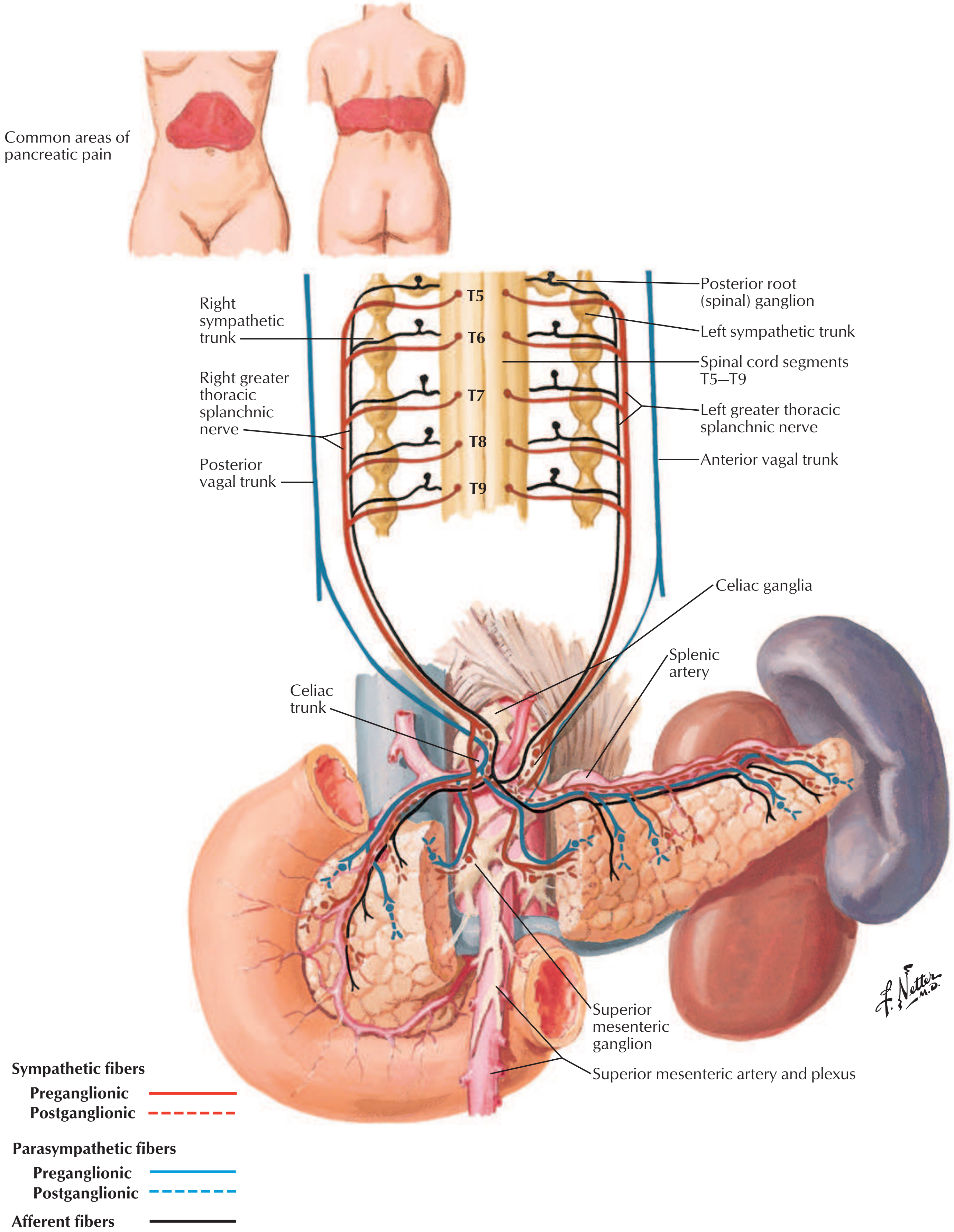
Autonomic Innervation of Liver: Schema

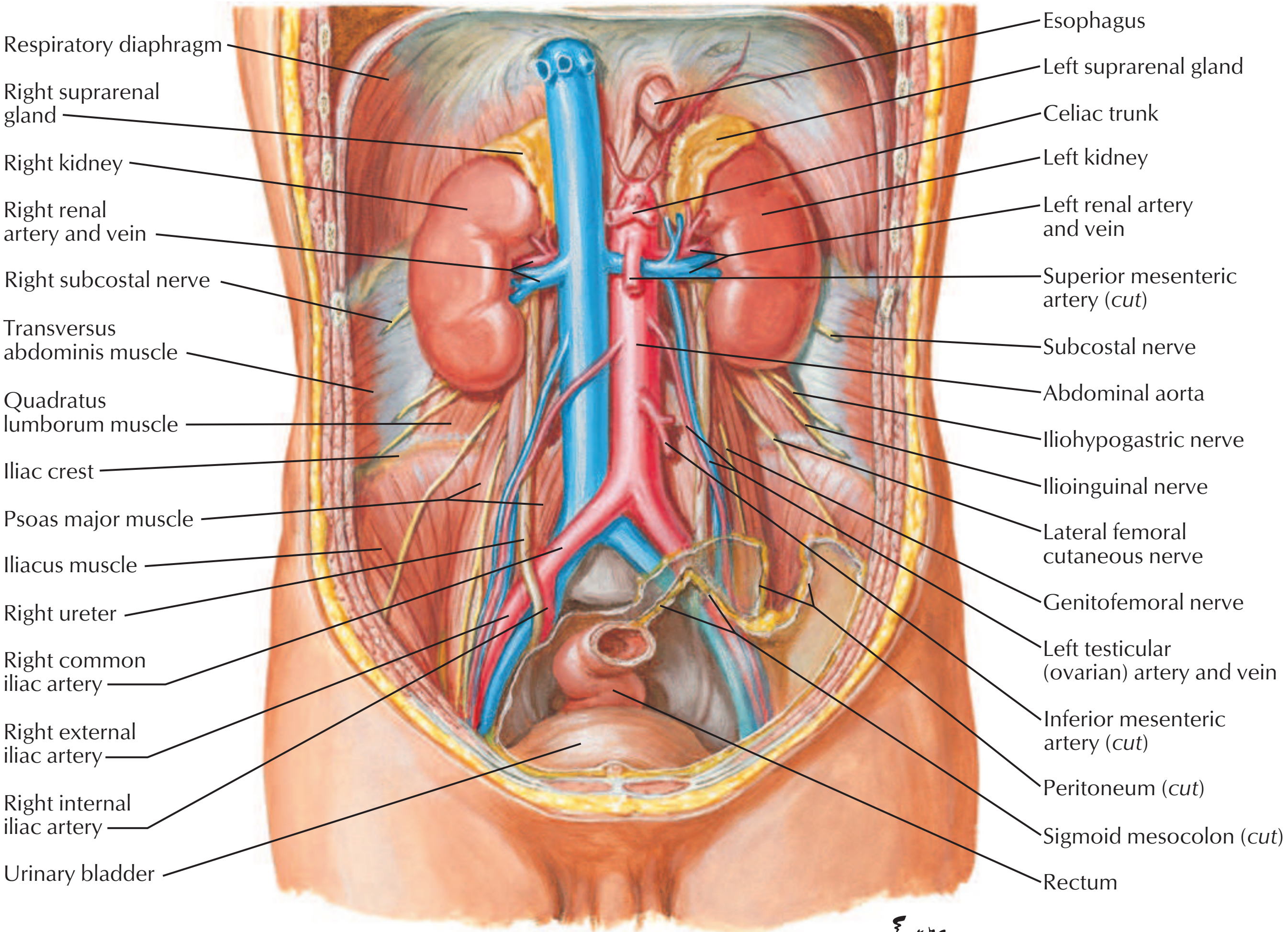
See also Plates 172, 173

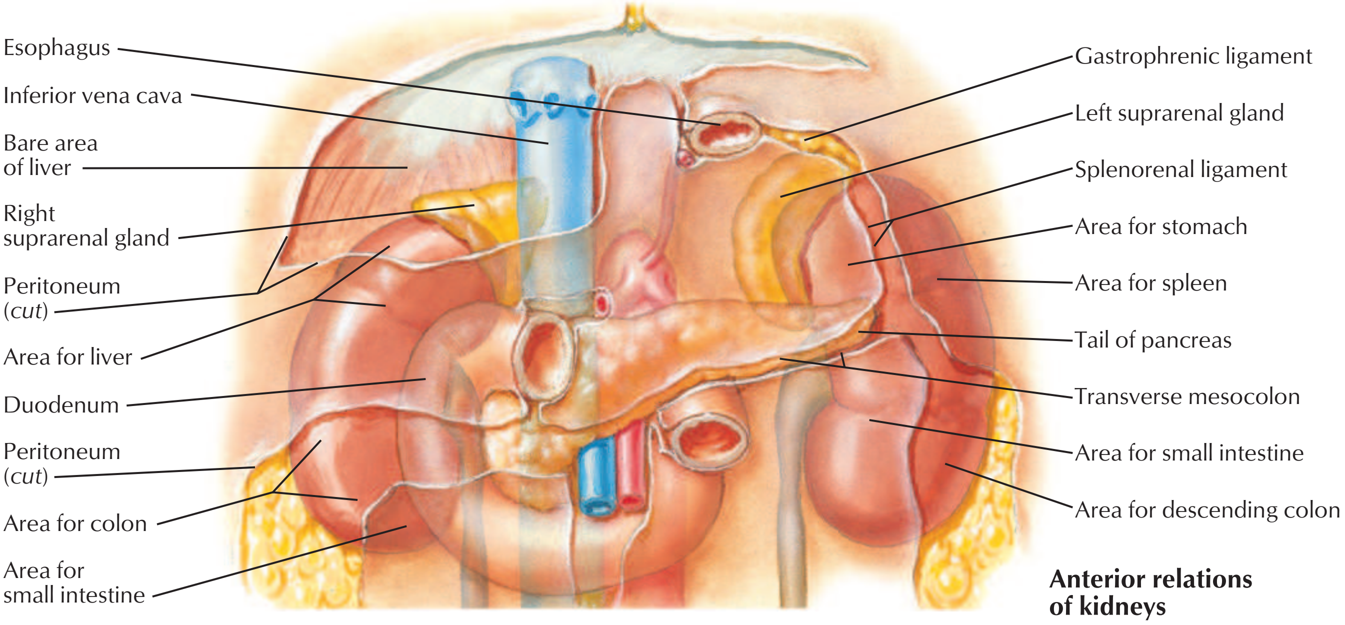

Common areas of referred pain in biliary disease
Sympathetic trunk
Posterior root (spinal) ganglion
Thoracic part of spinal cord
Left greater thoracic splanchnic nerve
Anterior vagal trunk
T7
T7
T7
T8
T8
T8
T9
T9
T9
T10
T10
T10
Right greater thoracic splanchnic nerve
Posterior vagal trunk
Right phrenic nerve to diaphragmatic part of parietal peritoneum
Liver
Hepatic branch of anterior vagal trunk
Respiratory diaphragm
Celiac ganglia
Common hepatic artery
Splenic artery
Gallbladder
Anterior hepatic plexus
Posterior hepatic plexus
Aorta
Gastroduodenal artery and plexus
Sphincter of hepatopancreatic ampulla
Sympathetic fibers
Preganglionic
Postganglionic
Parasympathetic fibers
Preganglionic
Postganglionic
Afferent fibers

Autonomic Innervation of Pancreas: Schema

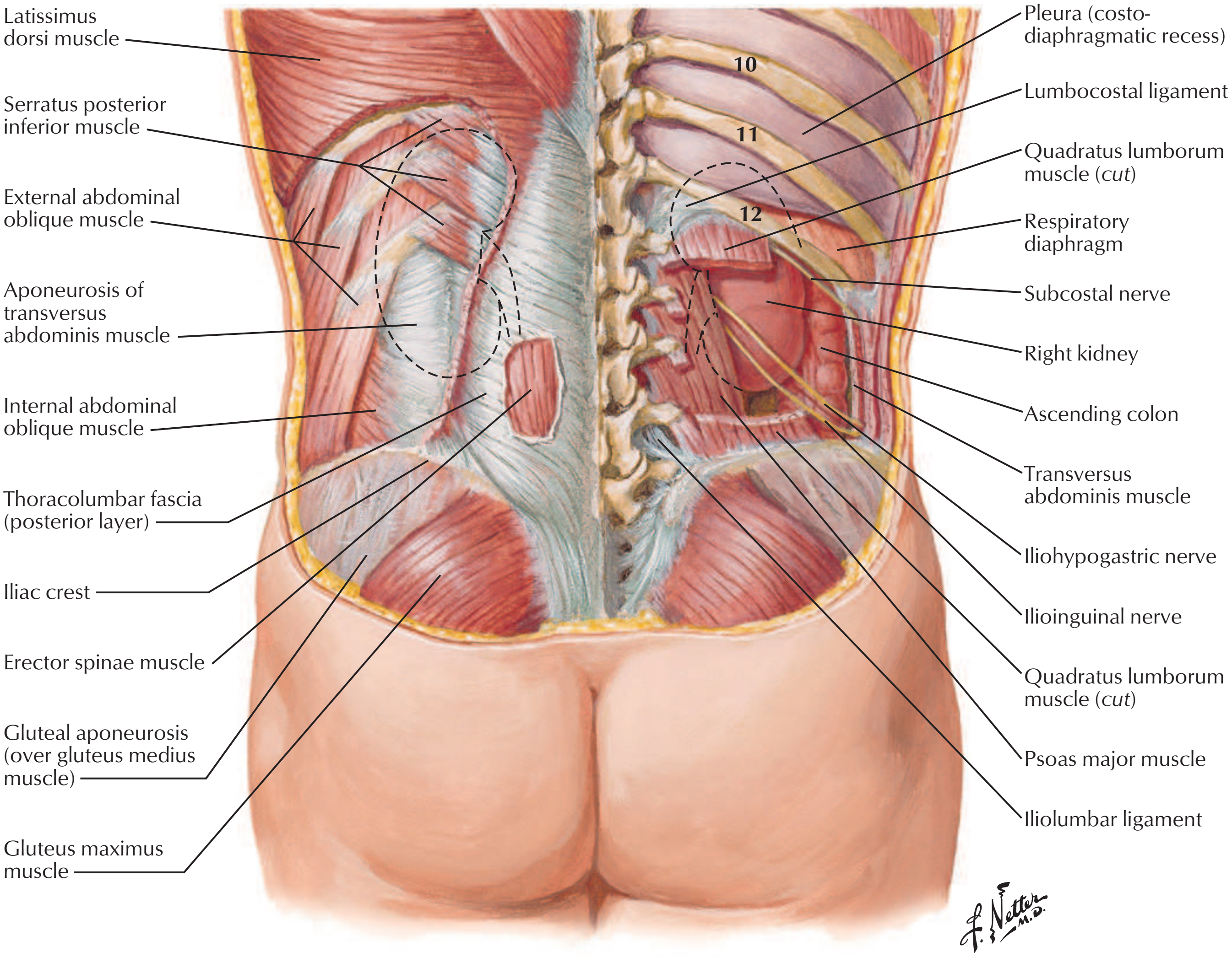
See also Plates 172, 173

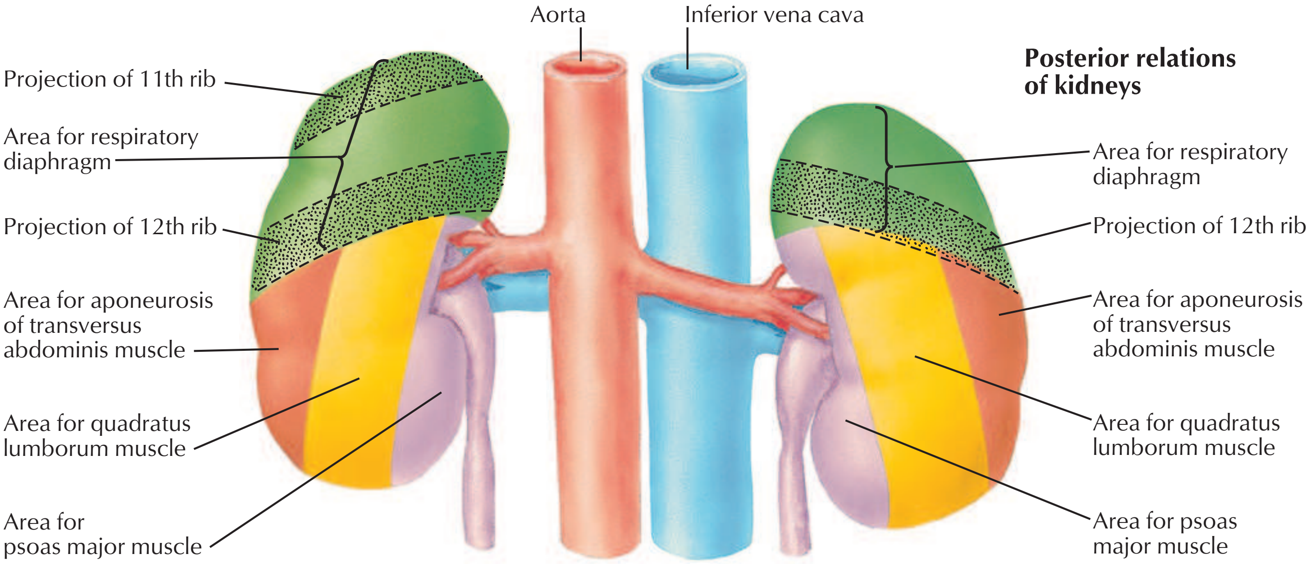

Common areas of pancreatic pain
Right sympathetic trunk
Right greater thoracic splanchnic nerve
Posterior vagal trunk
T5
T6
T7
T8
T9
Posterior root (spinal) ganglion
Left sympathetic trunk
Spinal cord segments T5–T9
Left greater thoracic splanchnic nerve
Anterior vagal trunk
Celiac ganglia
Splenic artery
Celiac trunk
Superior mesenteric ganglion
Superior mesenteric artery and plexus
Sympathetic fibers
Preganglionic
Postganglionic
Parasympathetic fibers
Preganglionic
Postganglionic
Afferent fibers

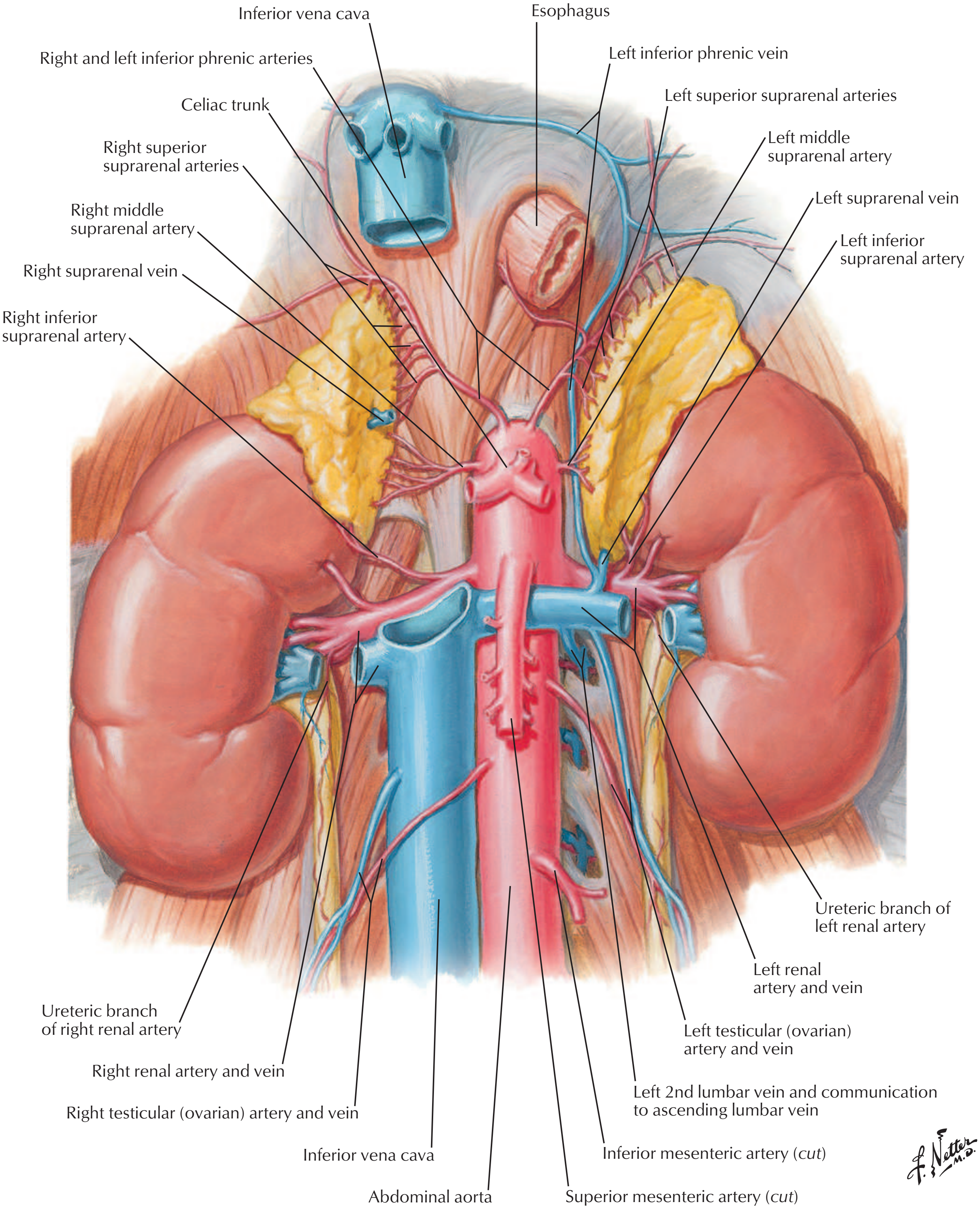

Respiratory diaphragm
Right suprarenal gland
Right kidney
Right renal artery and vein
Right subcostal nerve
Transversus abdominis muscle
Quadratus lumborum muscle
Iliac crest
Psoas major muscle
Iliacus muscle
Right ureter
Right common iliac artery
Right external iliac artery
Right internal iliac artery
Urinary bladder
Esophagus
Left suprarenal gland
Celiac trunk
Left kidney
Left renal artery and vein
Superior mesenteric artery (*cut*)
Subcostal nerve
Abdominal aorta
Iliohypogastric nerve
Ilioinguinal nerve
Lateral femoral cutaneous nerve
Genitofemoral nerve
Left testicular (ovarian) artery and vein
Inferior mesenteric artery (*cut*)
Peritoneum (*cut*)
Sigmoid mesocolon (*cut*)
Rectum

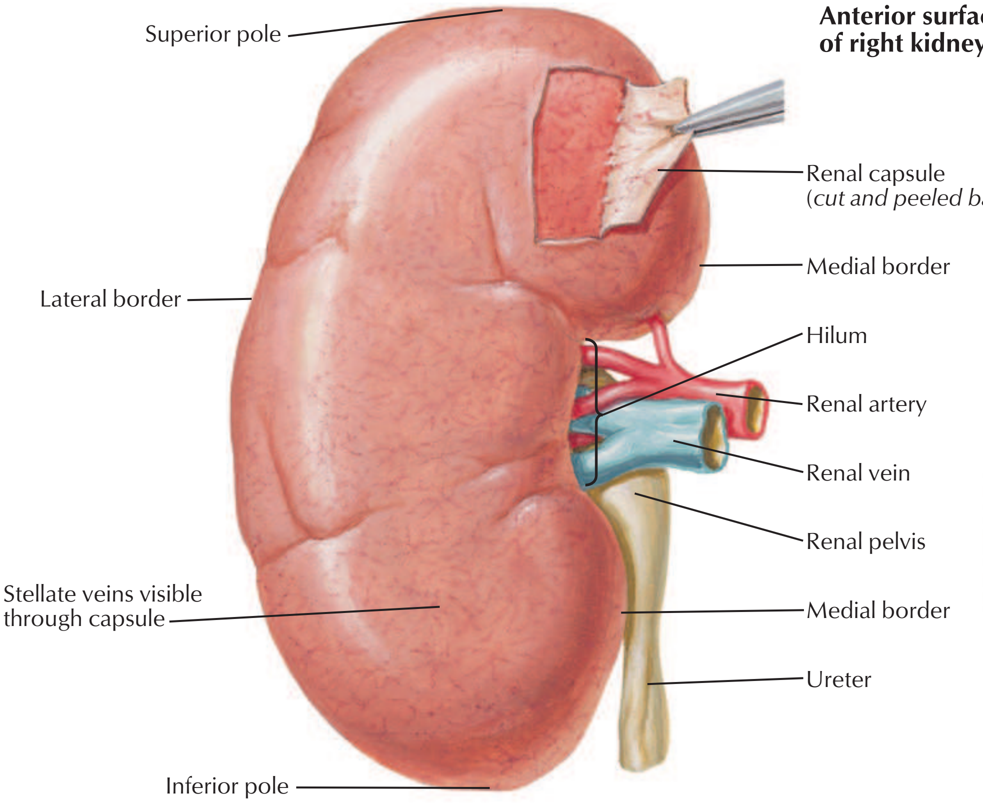

Esophagus
Inferior vena cava
Bare area of liver
Right suprarenal gland
Peritoneum (*cut*)
Area for liver
Duodenum
Peritoneum (*cut*)
Area for colon
Area for small intestine
Gastrophrenic ligament
Left suprarenal gland
Splenorenal ligament
Area for stomach
Area for spleen
Tail of pancreas
Transverse mesocolon
Area for small intestine
Area for descending colon

Anterior relations of kidneys


Latissimus dorsi muscle
Serratus posterior inferior muscle
External abdominal oblique muscle
Aponeurosis of transversus abdominis muscle
Internal abdominal oblique muscle
Thoracolumbar fascia (posterior layer)
Iliac crest
Erector spinae muscle
Gluteal aponeurosis (over gluteus medius muscle)
Gluteus maximus muscle
10
11
12
Pleura (costo-diaphragmatic recess)
Lumbocostal ligament
Quadratus lumborum muscle (*cut*)
Respiratory diaphragm
Subcostal nerve
Right kidney
Ascending colon
Transversus abdominis muscle
Iliohypogastric nerve
Ilioinguinal nerve
Quadratus lumborum muscle (*cut*)
Psoas major muscle
Iliolumbar ligament
F. Netter M.D.

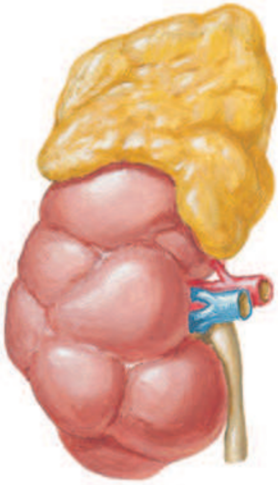

Aorta
Inferior vena cava
Posterior relations of kidneys
Projection of 11th rib
Area for respiratory diaphragm
Projection of 12th rib
Area for aponeurosis of transversus abdominis muscle
Area for quadratus lumborum muscle
Area for psoas major muscle
Area for respiratory diaphragm
Projection of 12th rib
Area for aponeurosis of transversus abdominis muscle
Area for quadratus lumborum muscle
Area for psoas major muscle


Inferior vena cava
Esophagus
Right and left inferior phrenic arteries
Left inferior phrenic vein
Celiac trunk
Left superior suprarenal arteries
Right superior suprarenal arteries
Left middle suprarenal artery
Right middle suprarenal artery
Left suprarenal vein
Right suprarenal vein
Left inferior suprarenal artery
Right inferior suprarenal artery
Ureteric branch of left renal artery
Left renal artery and vein
Ureteric branch of right renal artery
Left testicular (ovarian) artery and vein
Right renal artery and vein
Left 2nd lumbar vein and communication to ascending lumbar vein
Right testicular (ovarian) artery and vein
Inferior vena cava
Inferior mesenteric artery (*cut*)
Abdominal aorta
Superior mesenteric artery (*cut*)

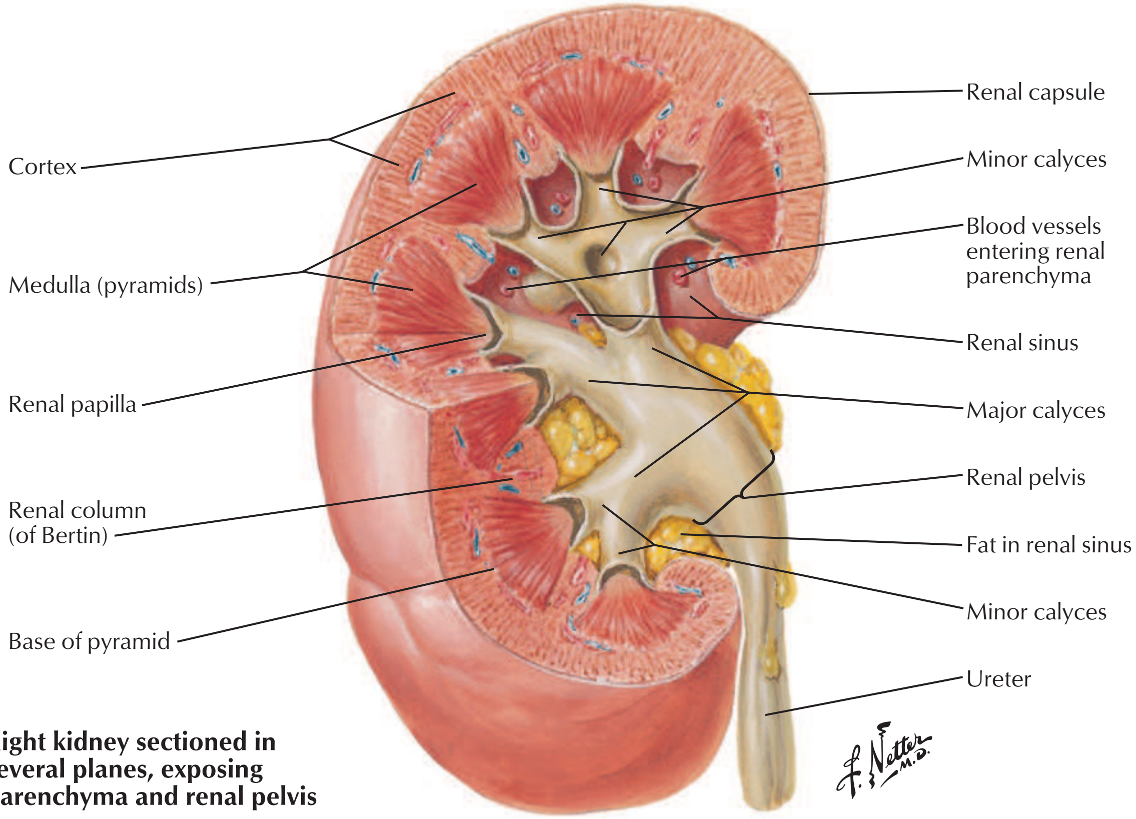


Anterior surface of right kidney

Superior pole
Renal capsule (*cut and peeled back*)
Medial border
Lateral border
Hilum
Renal artery
Renal vein
Renal pelvis
Stellate veins visible through capsule
Medial border
Ureter
Inferior pole



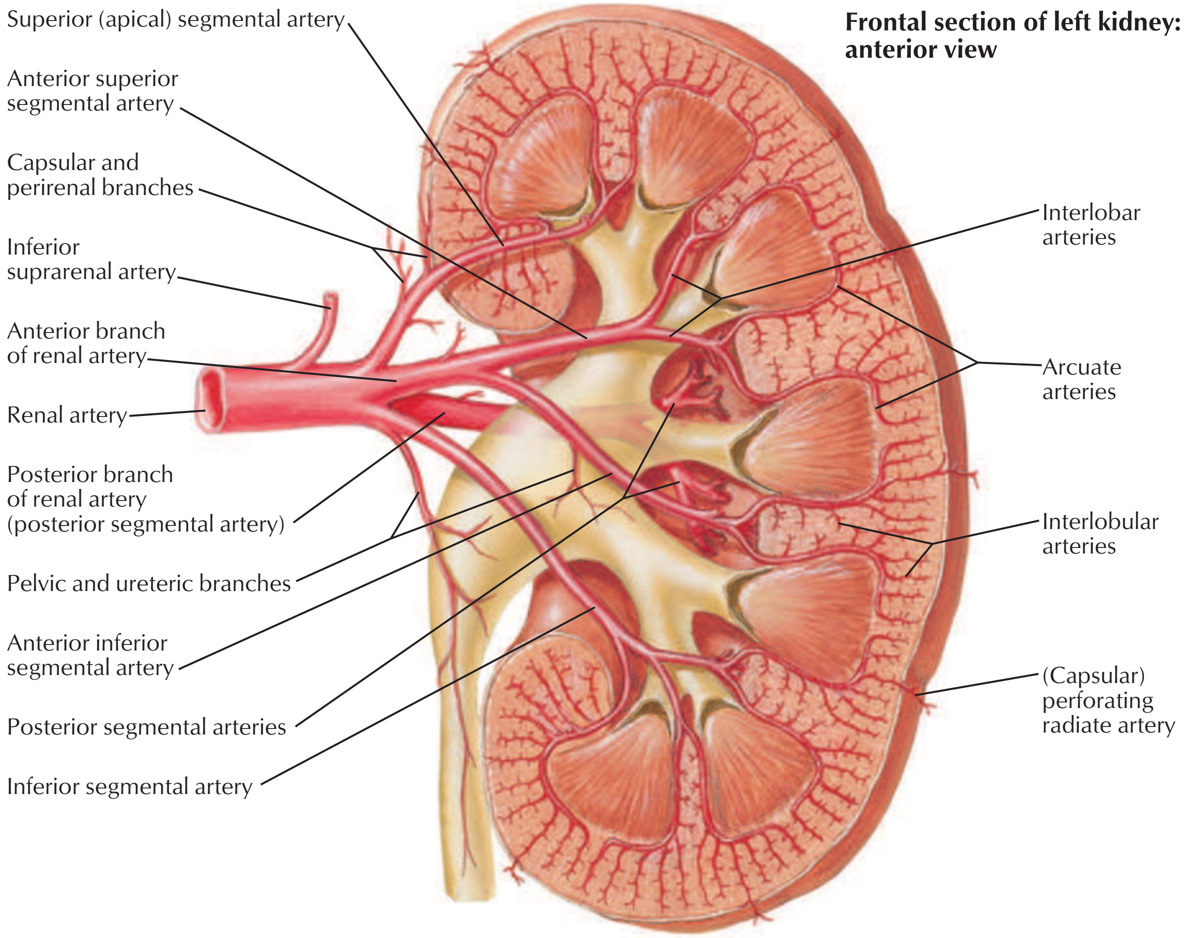
Suprarenal gland and lobulated kidney of infant



Right kidney sectioned in several planes, exposing parenchyma and renal pelvis

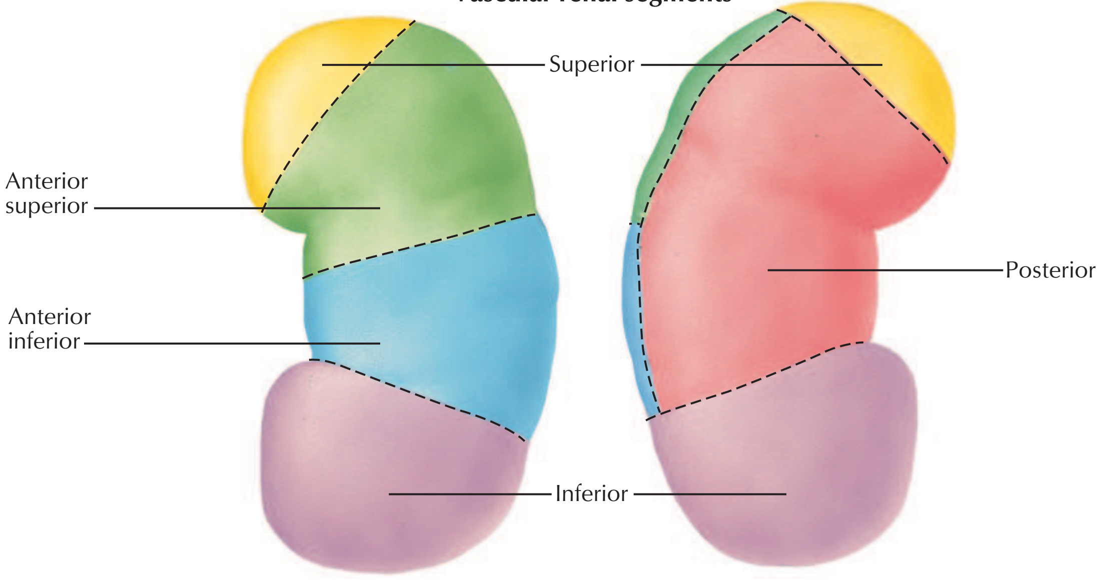
Renal capsule
Cortex
Minor calyces
Blood vessels entering renal parenchyma
Medulla (pyramids)
Renal sinus
Renal papilla
Major calyces
Renal pelvis
Renal column (of Bertin)
Fat in renal sinus
Minor calyces
Base of pyramid
Ureter
F. Netter M.D.

Intrarenal Arteries and Renal Segments


Frontal section of left kidney: anterior view

Superior (apical) segmental artery
Anterior superior segmental artery
Capsular and perirenal branches
Inferior suprarenal artery
Anterior branch of renal artery
Renal artery
Posterior branch of renal artery (posterior segmental artery)
Pelvic and ureteric branches
Anterior inferior segmental artery
Posterior segmental arteries
Inferior segmental artery
Interlobar arteries
Arcuate arteries
Interlobular arteries
(Capsular) perforating radiate artery

Vascular renal segments

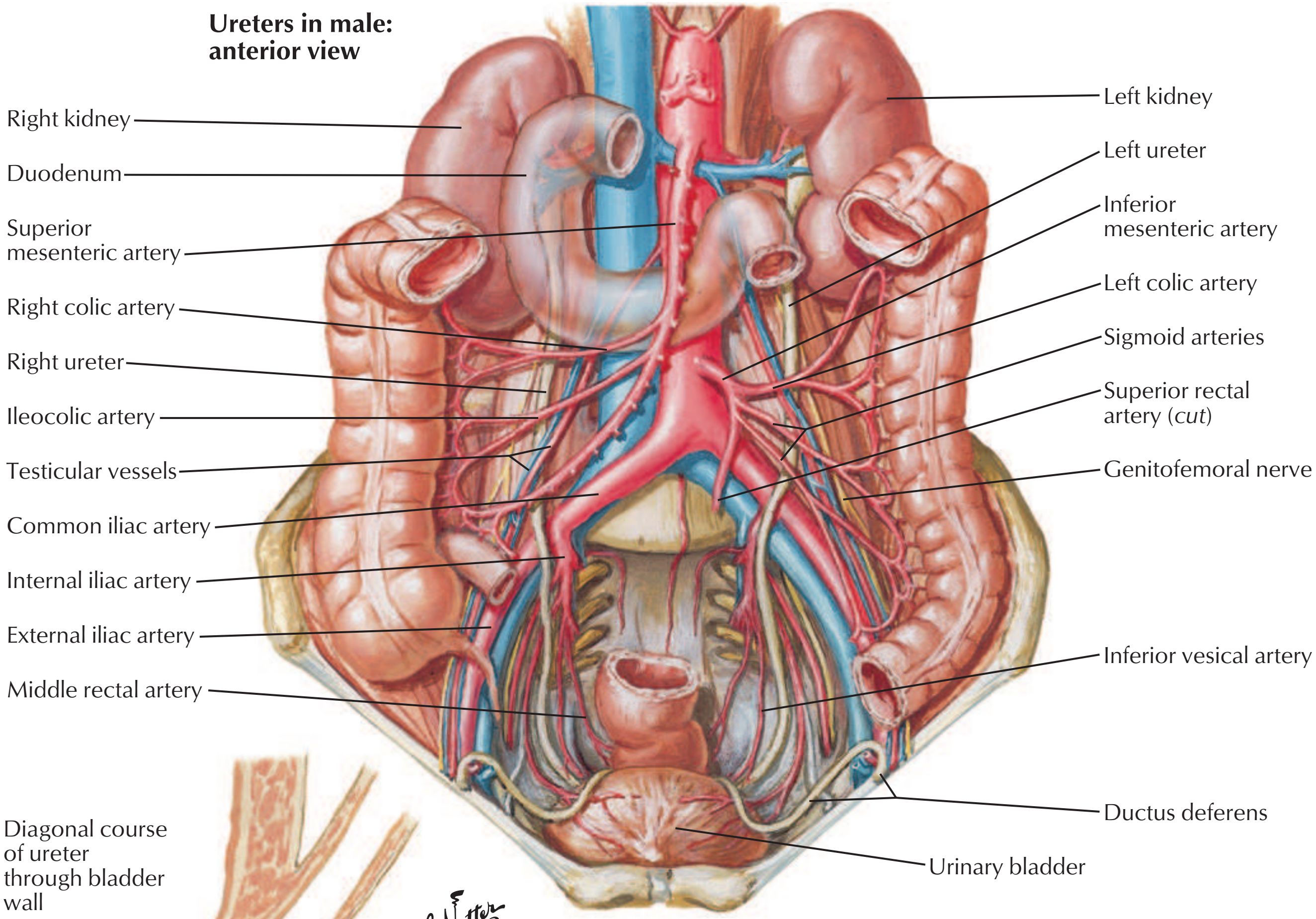

Superior
Anterior superior
Anterior inferior
Posterior
Inferior

Anterior surface of left kidney

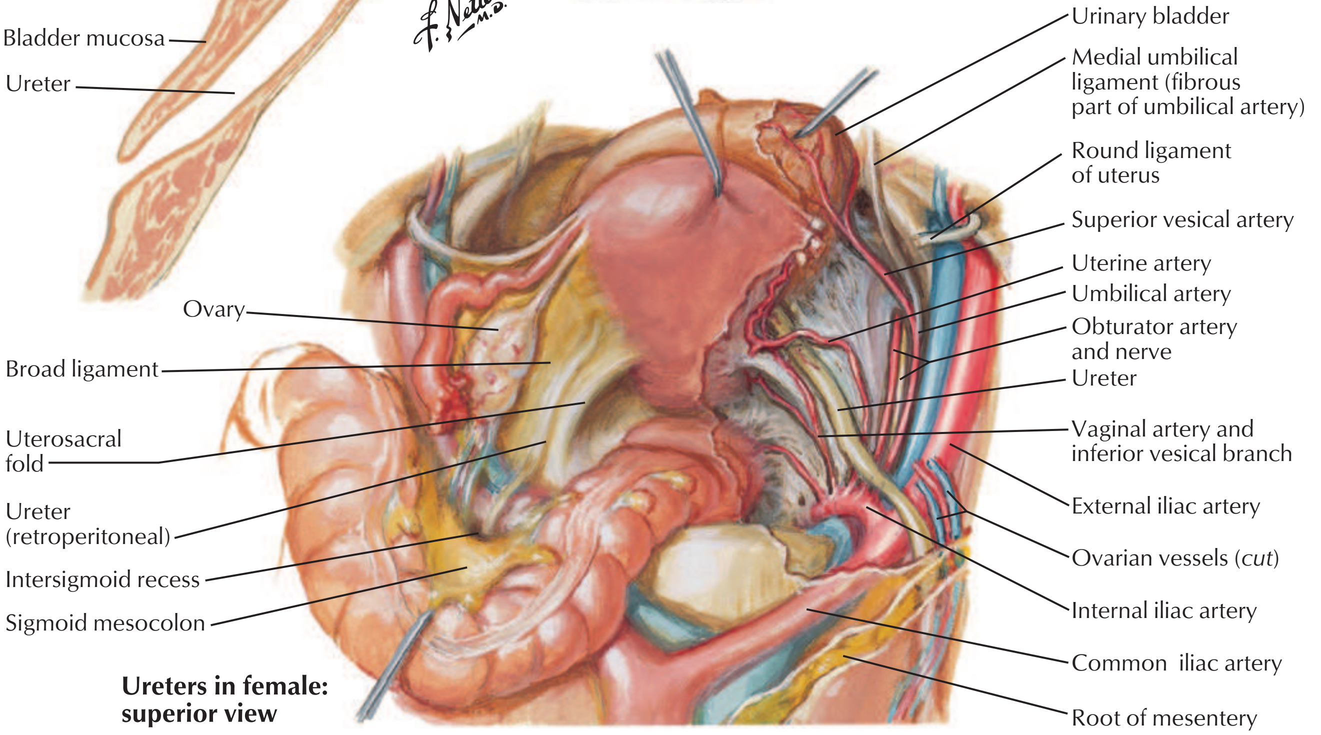
Posterior surface of left kidney

See also Plates 344, 346, 348

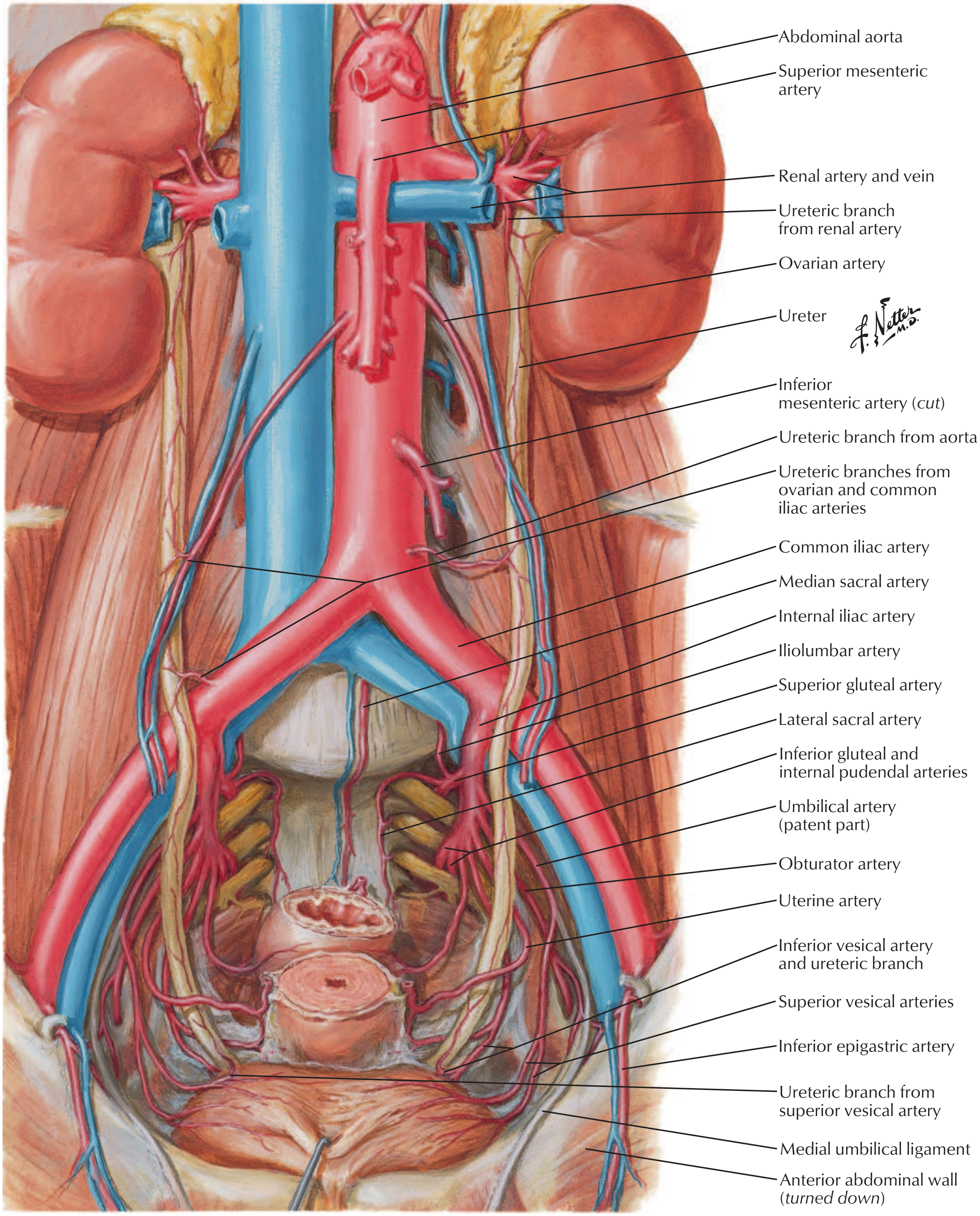
Ureters in male: anterior view

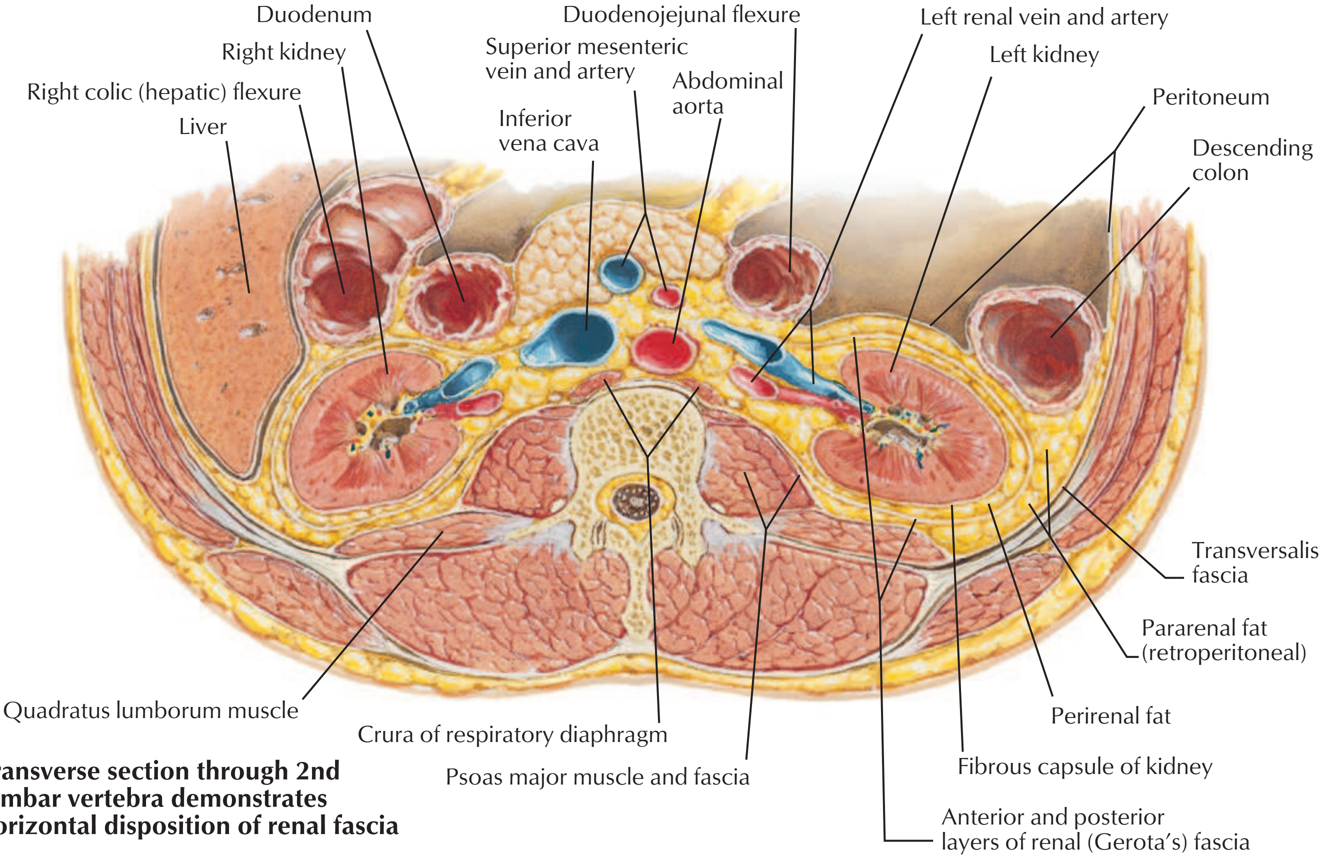

Right kidney
Duodenum
Superior mesenteric artery
Right colic artery
Right ureter
Ileocolic artery
Testicular vessels
Common iliac artery
Internal iliac artery
External iliac artery
Middle rectal artery
Left kidney
Left ureter
Inferior mesenteric artery
Left colic artery
Sigmoid arteries
Superior rectal artery (*cut*)
Genitofemoral nerve
Inferior vesical artery
Ductus deferens
Urinary bladder

Diagonal course of ureter through bladder wall

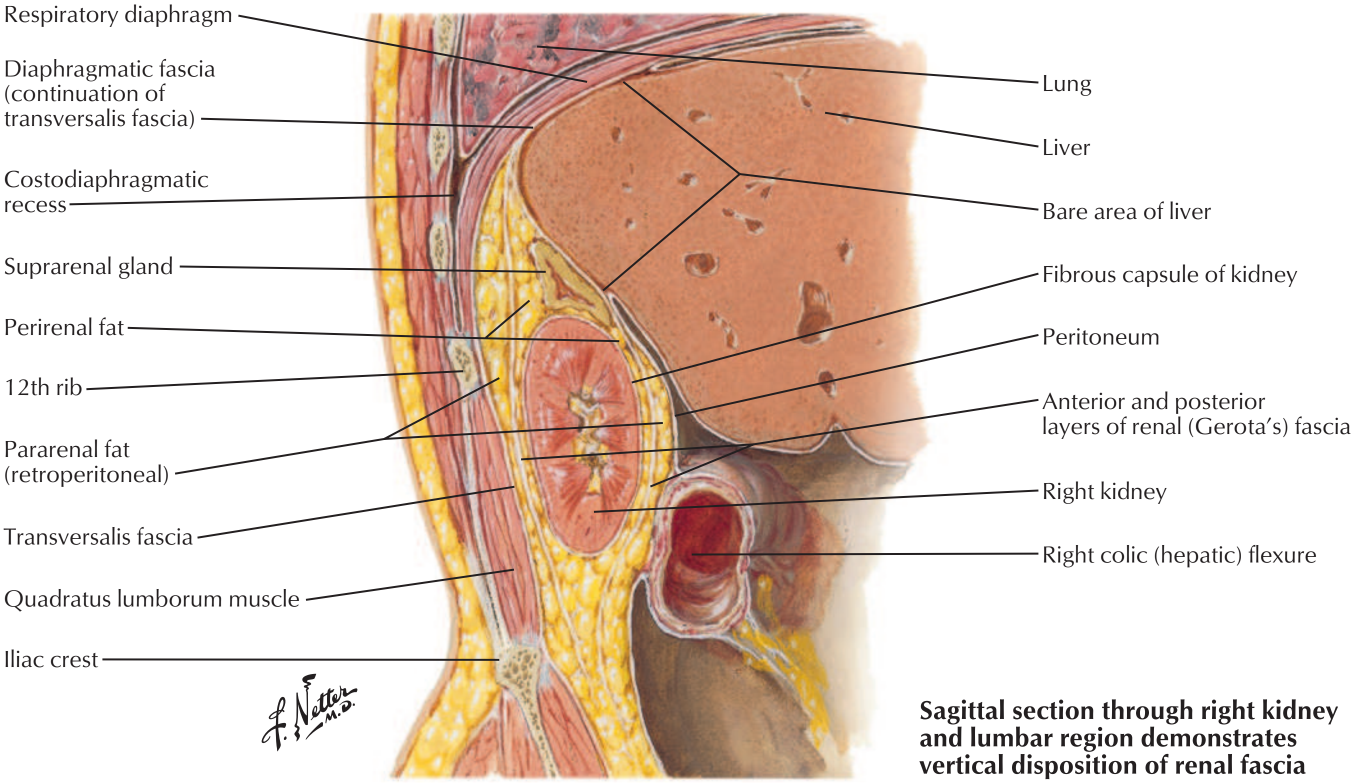

Bladder mucosa
Ureter
Urinary bladder
Medial umbilical ligament (fibrous part of umbilical artery)
Round ligament of uterus
Superior vesical artery
Uterine artery
Umbilical artery
Obturator artery and nerve
Ureter
Vaginal artery and inferior vesical branch
External iliac artery
Ovarian vessels (*cut*)
Internal iliac artery
Common iliac artery
Root of mesentery
Ovary
Broad ligament
Uterosacral fold
Ureter (retroperitoneal)
Intersigmoid recess
Sigmoid mesocolon

Ureters in female: superior view


Abdominal aorta
Superior mesenteric artery
Renal artery and vein
Ureteric branch from renal artery
Ovarian artery
Ureter
F. Netter M.D.
Inferior mesenteric artery (*cut*)
Ureteric branch from aorta
Ureteric branches from ovarian and common iliac arteries
Common iliac artery
Median sacral artery
Internal iliac artery
Iliolumbar artery
Superior gluteal artery
Lateral sacral artery
Inferior gluteal and internal pudendal arteries
Umbilical artery (patent part)
Obturator artery
Uterine artery
Inferior vesical artery and ureteric branch
Superior vesical arteries
Inferior epigastric artery
Ureteric branch from superior vesical artery
Medial umbilical ligament
Anterior abdominal wall (*turned down*)


Duodenum
Right kidney
Right colic (hepatic) flexure
Liver
Duodenojejunal flexure
Superior mesenteric vein and artery
Abdominal aorta
Inferior vena cava
Left renal vein and artery
Left kidney
Peritoneum
Descending colon
Transversalis fascia
Pararenal fat (retroperitoneal)
Perirenal fat
Fibrous capsule of kidney
Anterior and posterior layers of renal (Gerota's) fascia
Quadratus lumborum muscle
Crura of respiratory diaphragm
Psoas major muscle and fascia

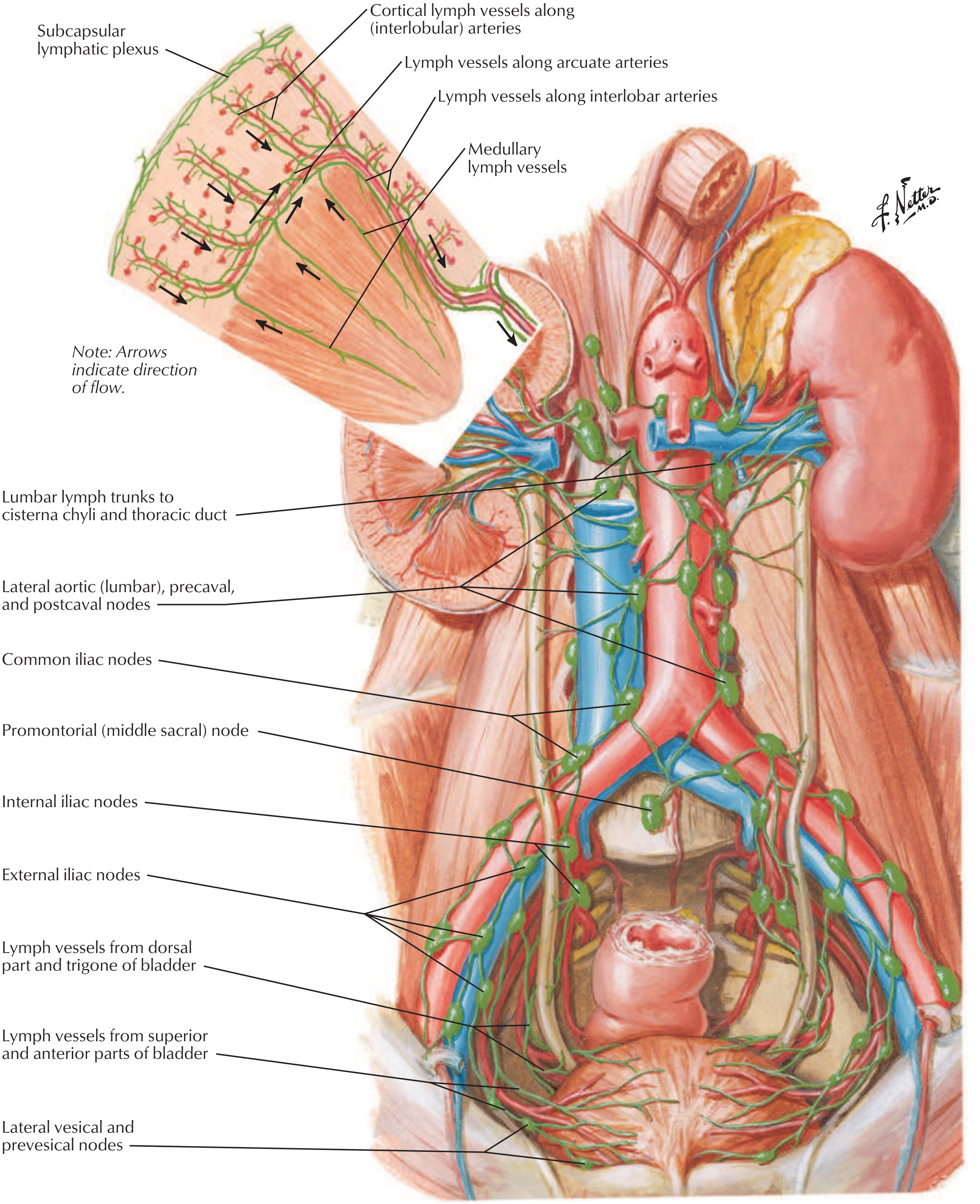
Transverse section through 2nd lumbar vertebra demonstrates horizontal disposition of renal fascia


Respiratory diaphragm
Diaphragmatic fascia (continuation of transversalis fascia)
Costodiaphragmatic recess
Suprarenal gland
Perirenal fat
12th rib
Pararenal fat (retroperitoneal)
Transversalis fascia
Quadratus lumborum muscle
Iliac crest
F. Netter M.D.
Lung
Liver
Bare area of liver
Fibrous capsule of kidney
Peritoneum
Anterior and posterior layers of renal (Gerota's) fascia
Right kidney
Right colic (hepatic) flexure

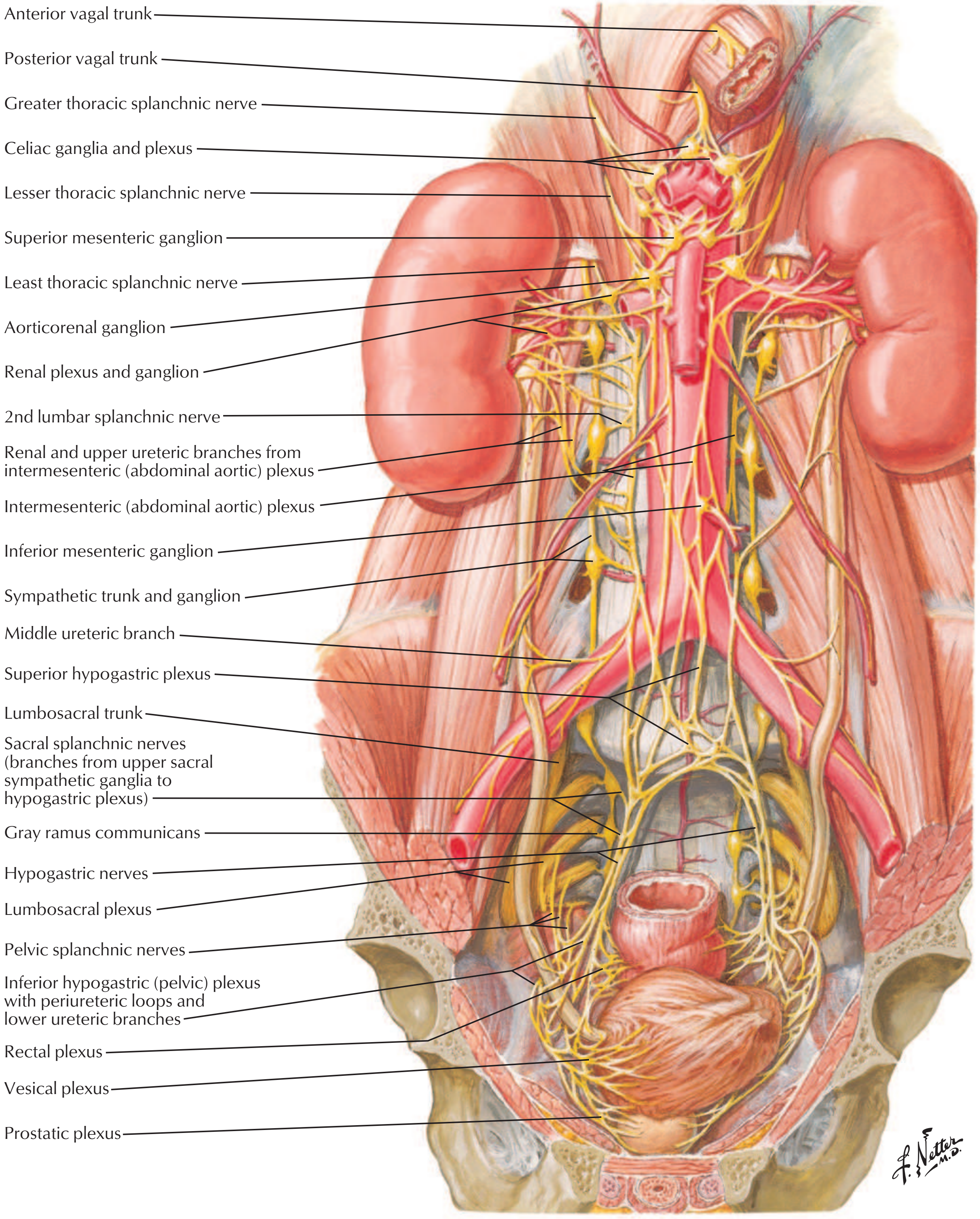
Sagittal section through right kidney and lumbar region demonstrates vertical disposition of renal fascia

Lymph Vessels and Nodes of Kidneys and Urinary Bladder

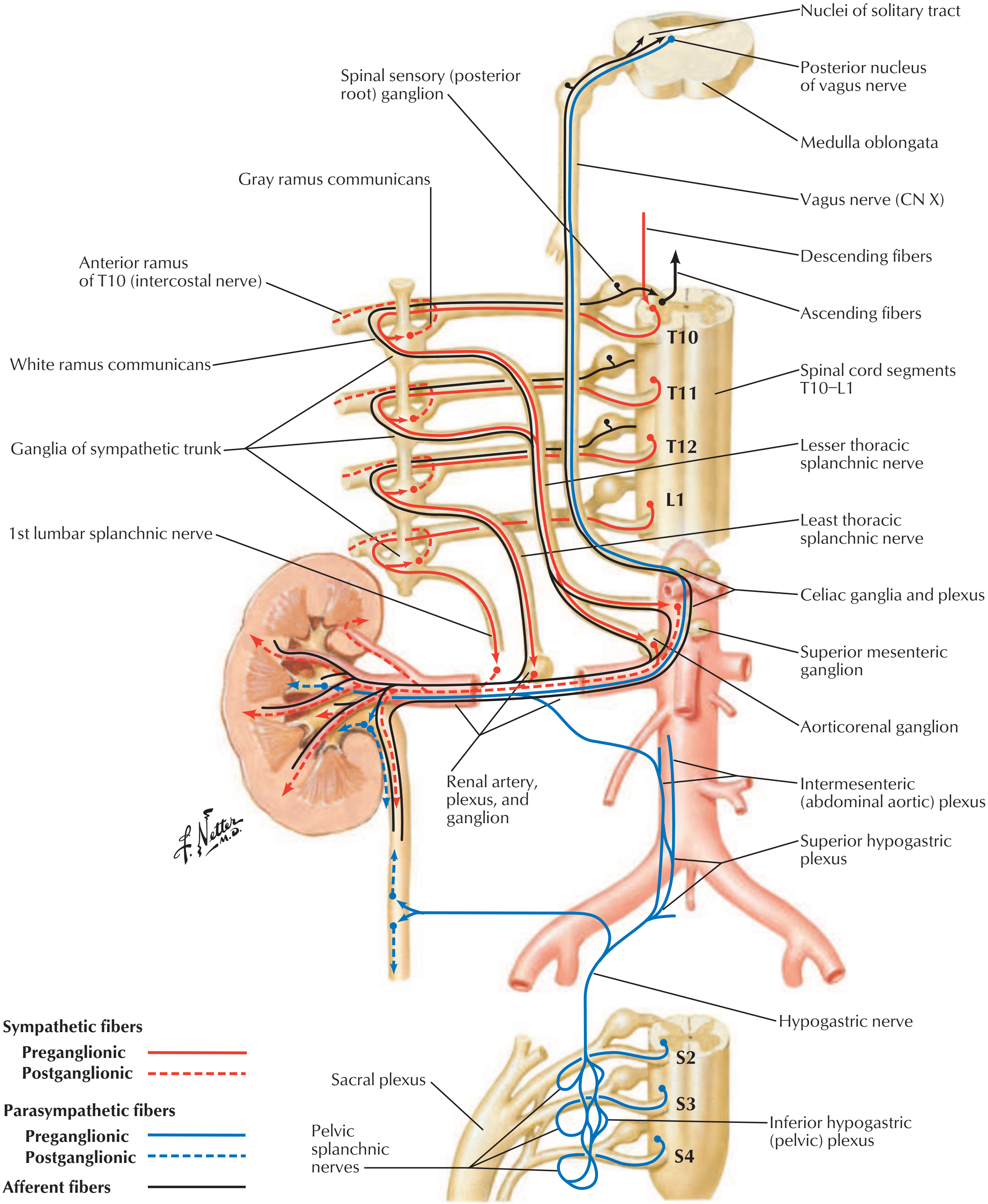
See also **Plates 388, 390**



Subcapsular lymphatic plexus
Cortical lymph vessels along (interlobular) arteries
Lymph vessels along arcuate arteries
Lymph vessels along interlobar arteries
Medullary lymph vessels
Note: Arrows indicate direction of flow.
Lumbar lymph trunks to cisterna chyli and thoracic duct
Lateral aortic (lumbar), precaval, and postcaval nodes
Common iliac nodes
Promontorial (middle sacral) node
Internal iliac nodes
External iliac nodes
Lymph vessels from dorsal part and trigone of bladder
Lymph vessels from superior and anterior parts of bladder
Lateral vesical and prevesical nodes

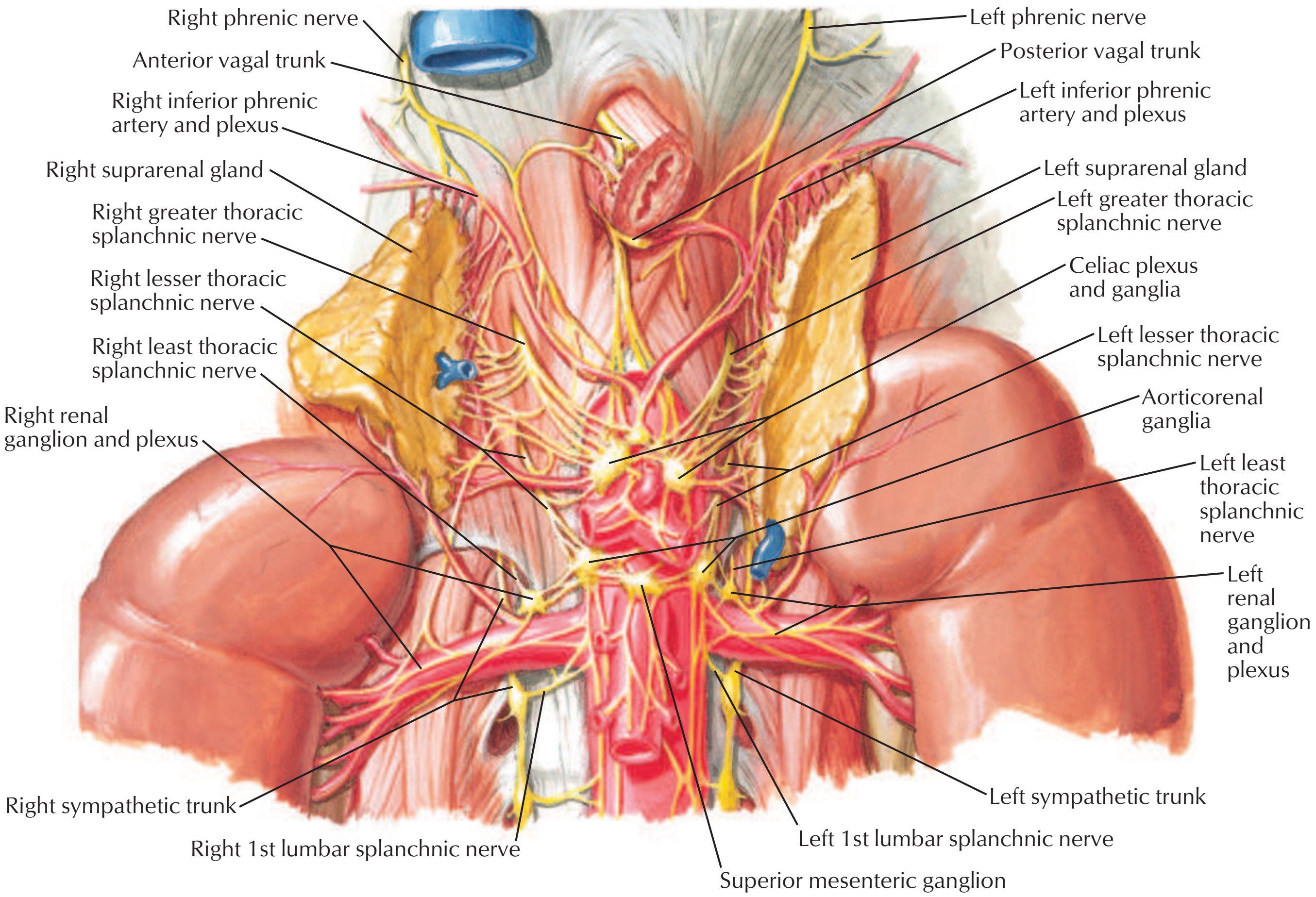

Anterior vagal trunk
Posterior vagal trunk
Greater thoracic splanchnic nerve
Celiac ganglia and plexus
Lesser thoracic splanchnic nerve
Superior mesenteric ganglion
Least thoracic splanchnic nerve
Aorticorenal ganglion
Renal plexus and ganglion
2nd lumbar splanchnic nerve
Renal and upper ureteric branches from intermesenteric (abdominal aortic) plexus
Intermesenteric (abdominal aortic) plexus
Inferior mesenteric ganglion
Sympathetic trunk and ganglion
Middle ureteric branch
Superior hypogastric plexus
Lumbosacral trunk
Sacral splanchnic nerves (branches from upper sacral sympathetic ganglia to hypogastric plexus)
Gray ramus communicans
Hypogastric nerves
Lumbosacral plexus
Pelvic splanchnic nerves
Inferior hypogastric (pelvic) plexus with periureteric loops and lower ureteric branches
Rectal plexus
Vesical plexus
Prostatic plexus

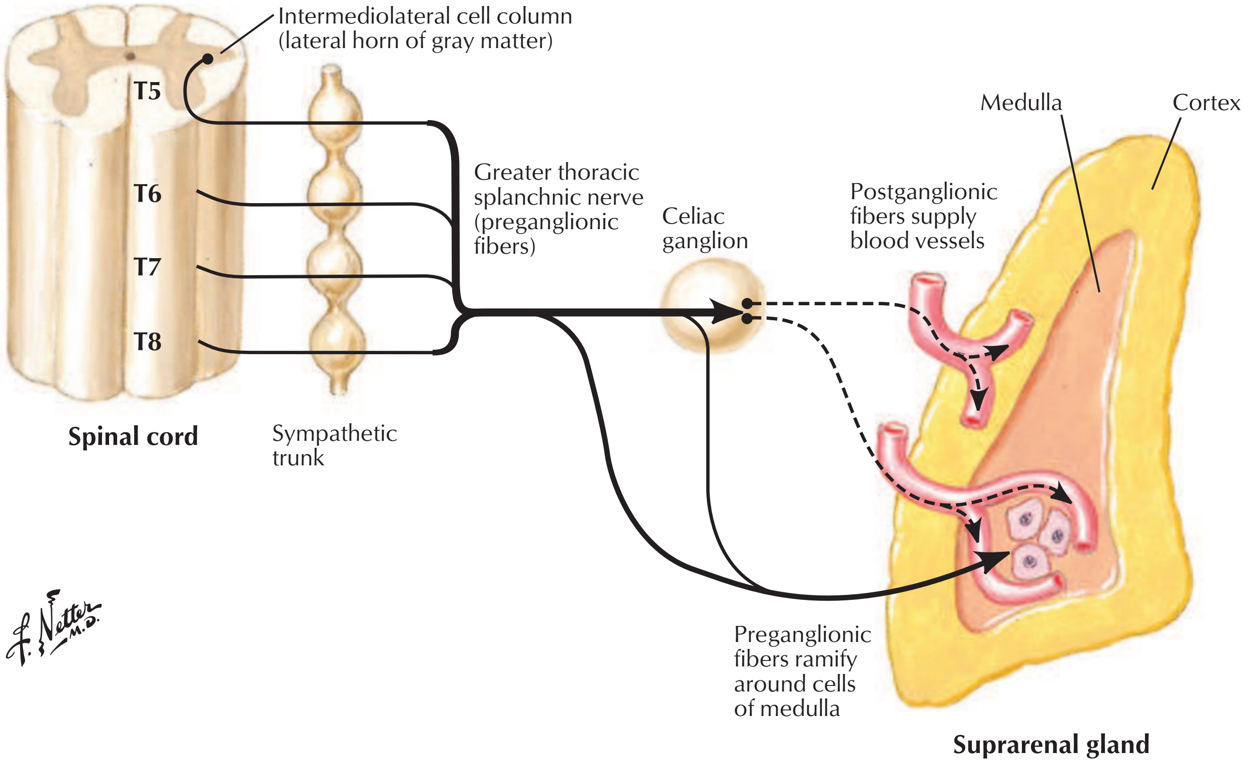
Autonomic Innervation of Kidneys and Upper Ureters: Schema

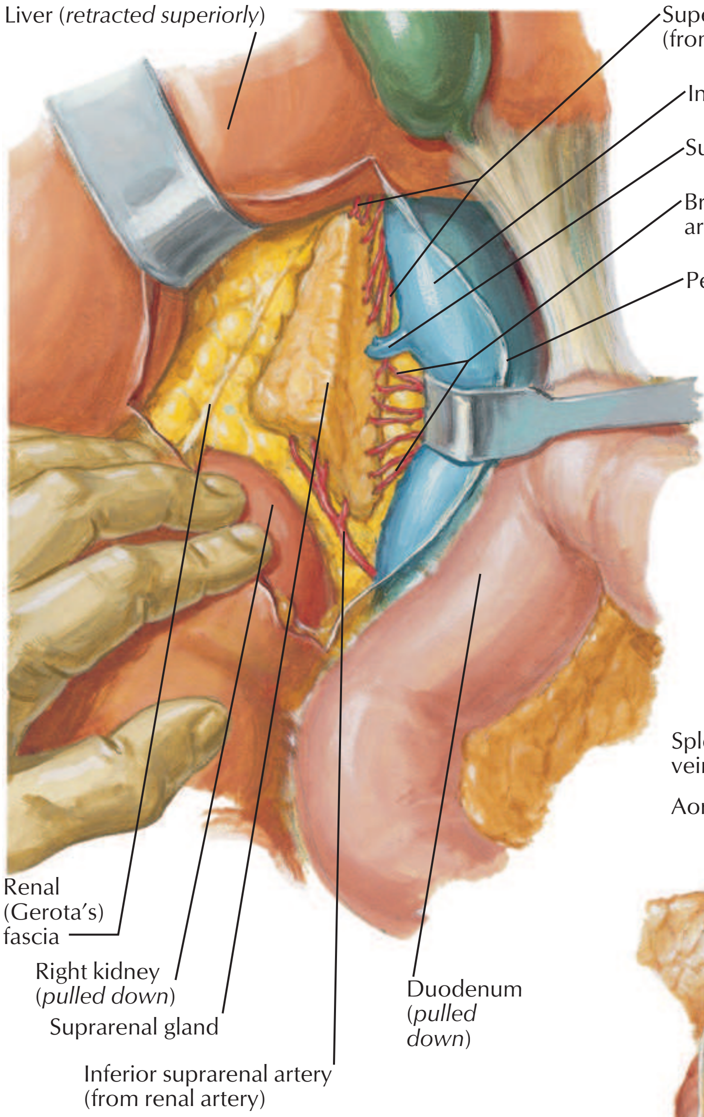

Nuclei of solitary tract
Posterior nucleus of vagus nerve
Medulla oblongata
Spinal sensory (posterior root) ganglion
Gray ramus communicans
Vagus nerve (CN X)
Descending fibers
Anterior ramus of T10 (intercostal nerve)
Ascending fibers
T10
White ramus communicans
T11
Spinal cord segments T10–L1
Ganglia of sympathetic trunk
T12
Lesser thoracic splanchnic nerve
L1
Least thoracic splanchnic nerve
1st lumbar splanchnic nerve
Celiac ganglia and plexus
Superior mesenteric ganglion
Aorticorenal ganglion
Renal artery, plexus, and ganglion
Intermesenteric (abdominal aortic) plexus
Superior hypogastric plexus
Hypogastric nerve
Sympathetic fibers
Preganglionic
Postganglionic
S2
Sacral plexus
S3
Parasympathetic fibers
Preganglionic
Postganglionic
Pelvic splanchnic nerves
Inferior hypogastric (pelvic) plexus
S4
Afferent fibers

Autonomic Nerves of Suprarenal Glands: Dissection and Schema

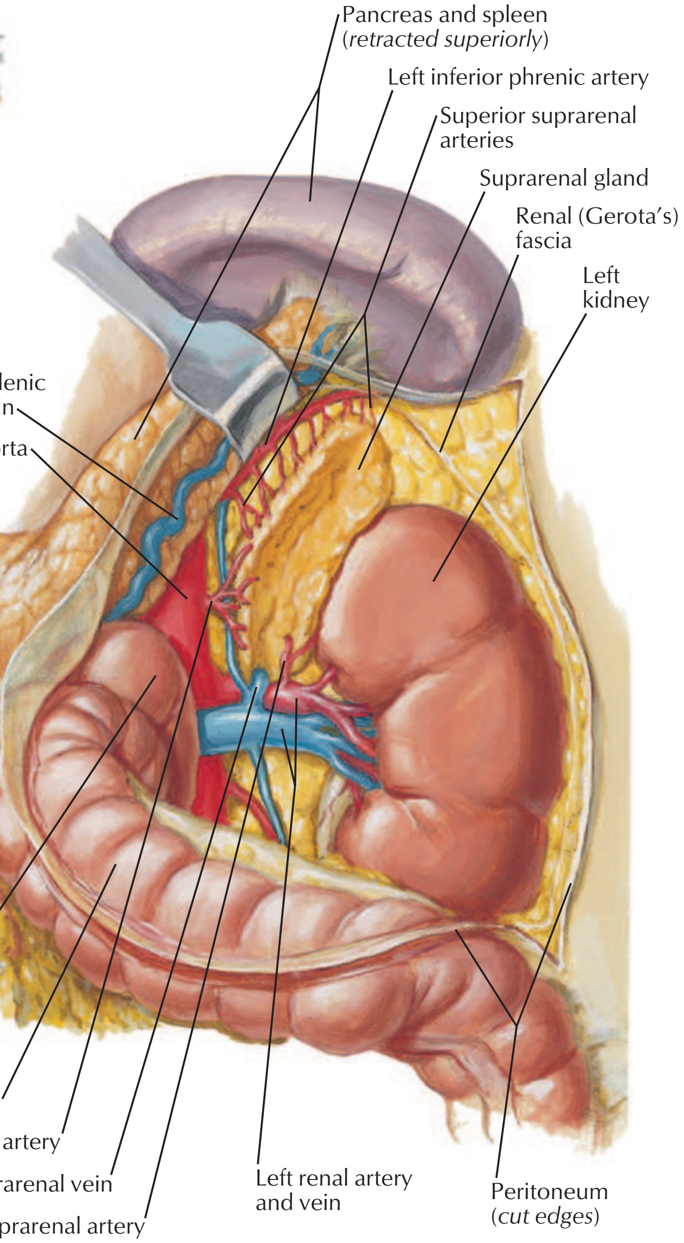
See also Plates 172, 173


Right phrenic nerve
Anterior vagal trunk
Right inferior phrenic artery and plexus
Right suprarenal gland
Right greater thoracic splanchnic nerve
Right lesser thoracic splanchnic nerve
Right least thoracic splanchnic nerve
Right renal ganglion and plexus
Right sympathetic trunk
Right 1st lumbar splanchnic nerve
Left phrenic nerve
Posterior vagal trunk
Left inferior phrenic artery and plexus
Left suprarenal gland
Left greater thoracic splanchnic nerve
Celiac plexus and ganglia
Left lesser thoracic splanchnic nerve
Aorticorenal ganglia
Left least thoracic splanchnic nerve
Left renal ganglion and plexus
Left sympathetic trunk
Left 1st lumbar splanchnic nerve
Superior mesenteric ganglion


Intermediolateral cell column (lateral horn of gray matter)
T5
T6
T7
T8
Spinal cord
Sympathetic trunk
Greater thoracic splanchnic nerve (preganglionic fibers)
Celiac ganglion
Postganglionic fibers supply blood vessels
Medulla
Cortex
Preganglionic fibers ramify around cells of medulla
Suprarenal gland

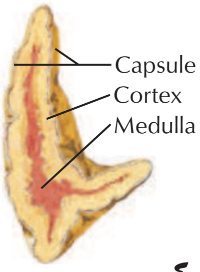

Liver (*retracted superiorly*)
Superior suprarenal arteries (from inferior phrenic artery)
Inferior vena cava (*retracted medially*)
Suprarenal vein
Branches of middle suprarenal arteries (from abdominal aorta)
Peritoneum (*cut edge*)
Renal (Gerota's) fascia
Right kidney (*pulled down*)
Suprarenal gland
Inferior suprarenal artery (from renal artery)
Duodenum (*pulled down*)

Abdominal exposure of right suprarenal gland

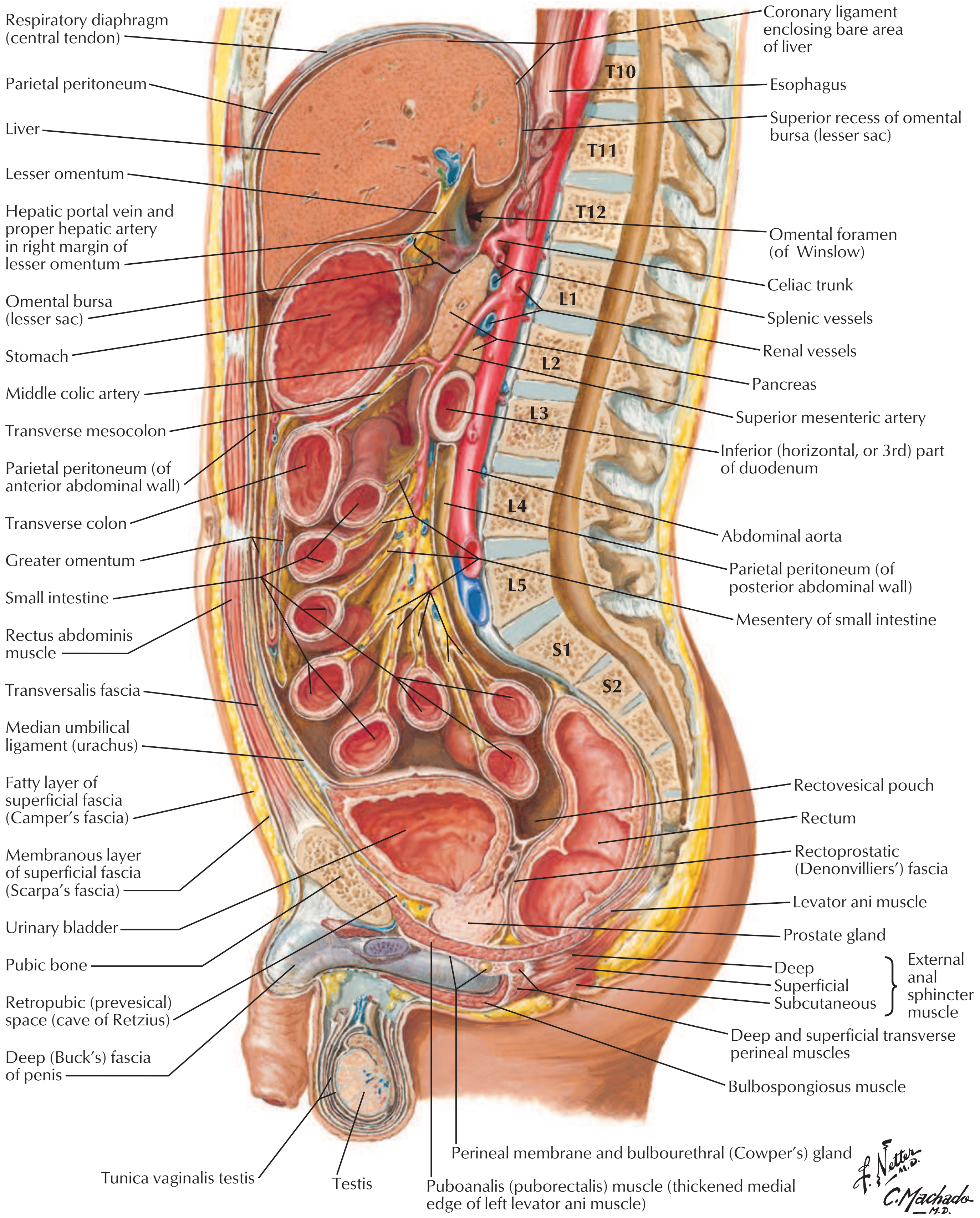

Pancreas and spleen (*retracted superiorly*)
Left inferior phrenic artery
Superior suprarenal arteries
Suprarenal gland
Renal (Gerota's) fascia
Left kidney
Splenic vein
Aorta
Duodeno-jejunal flexure
Left colic (splenic) flexure (*pulled medially*)
Middle suprarenal artery
Suprarenal vein
Inferior suprarenal artery
Left renal artery and vein
Peritoneum (*cut edges*)

Abdominal exposure of left suprarenal gland

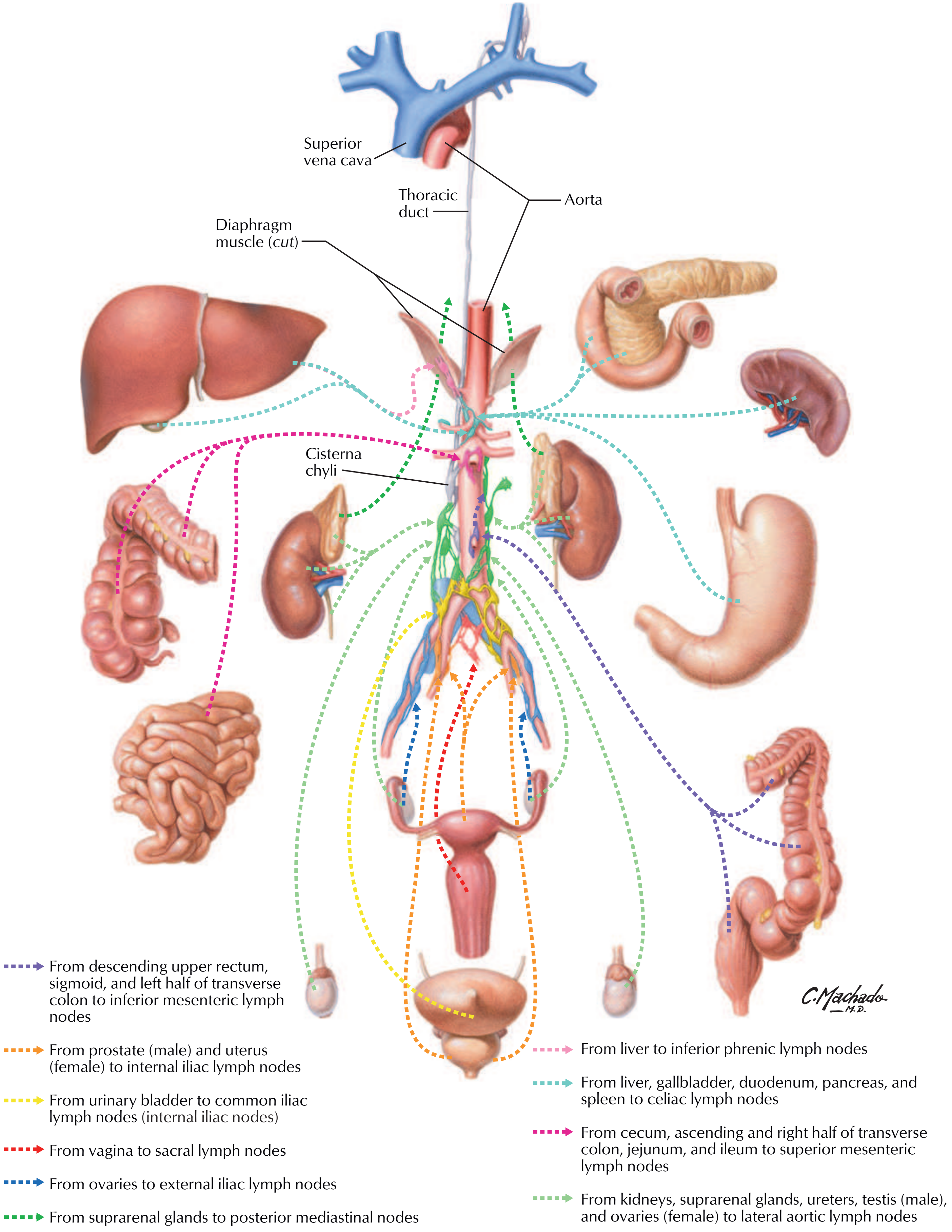
Cross section through suprarenal gland


Capsule
Cortex
Medulla

Abdominal Wall and Viscera: Paramedian (Parasagittal) Section


Respiratory diaphragm (central tendon)
Parietal peritoneum
Liver
Lesser omentum
Hepatic portal vein and proper hepatic artery in right margin of lesser omentum
Omental bursa (lesser sac)
Stomach
Middle colic artery
Transverse mesocolon
Parietal peritoneum (of anterior abdominal wall)
Transverse colon
Greater omentum
Small intestine
Rectus abdominis muscle
Transversalis fascia
Median umbilical ligament (urachus)
Fatty layer of superficial fascia (Camper's fascia)
Membranous layer of superficial fascia (Scarpa's fascia)
Urinary bladder
Pubic bone
Retropubic (prevesical) space (cave of Retzius)
Deep (Buck's) fascia of penis
Tunica vaginalis testis
Testis
Coronary ligament enclosing bare area of liver
Esophagus
Superior recess of omental bursa (lesser sac)
Omental foramen (of Winslow)
Celiac trunk
Splenic vessels
Renal vessels
Pancreas
Superior mesenteric artery
Inferior (horizontal, or 3rd) part of duodenum
Abdominal aorta
Parietal peritoneum (of posterior abdominal wall)
Mesentery of small intestine
T10
T11
T12
L1
L2
L3
L4
L5
S1
S2
Rectovesical pouch
Rectum
Rectoprostatic (Denonvilliers') fascia
Levator ani muscle
Prostate gland
Deep
Superficial
Subcutaneous
External anal sphincter muscle
Deep and superficial transverse perineal muscles
Bulbospongiosus muscle
Perineal membrane and bulbourethral (Cowper's) gland
Puboanalis (puborectalis) muscle (thickened medial edge of left levator ani muscle)
F. Netter M.D.
C. Machado M.D.

Abdominal and Pelvic Lymphatics: Schema


Superior vena cava
Thoracic duct
Aorta
Diaphragm muscle (*cut*)
Cisterna chyli
C.Machado M.D.

From descending upper rectum, sigmoid, and left half of transverse colon to inferior mesenteric lymph nodes

From prostate (male) and uterus (female) to internal iliac lymph nodes

From urinary bladder to common iliac lymph nodes (internal iliac nodes)

From vagina to sacral lymph nodes

From ovaries to external iliac lymph nodes

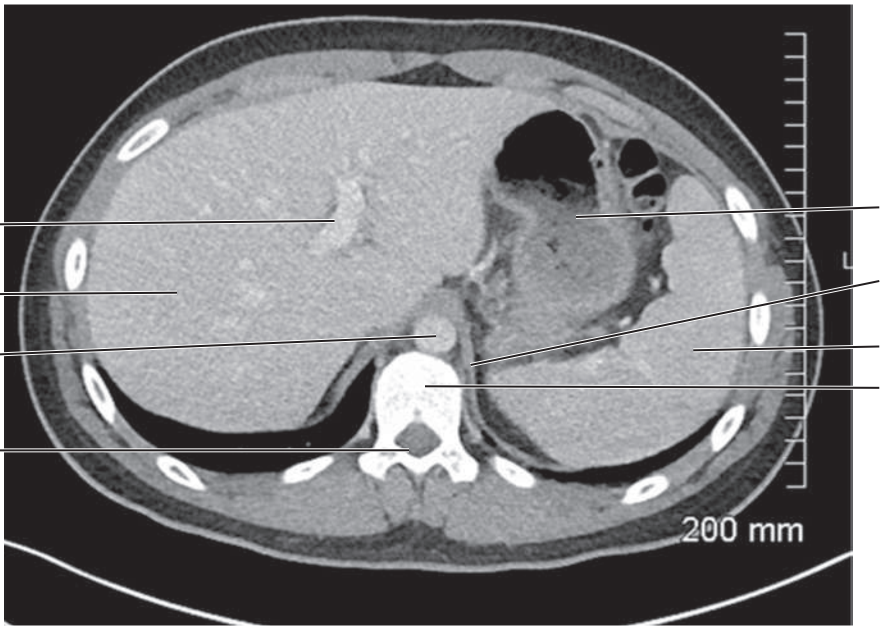
From suprarenal glands to posterior mediastinal nodes

From liver to inferior phrenic lymph nodes

From liver, gallbladder, duodenum, pancreas, and spleen to celiac lymph nodes

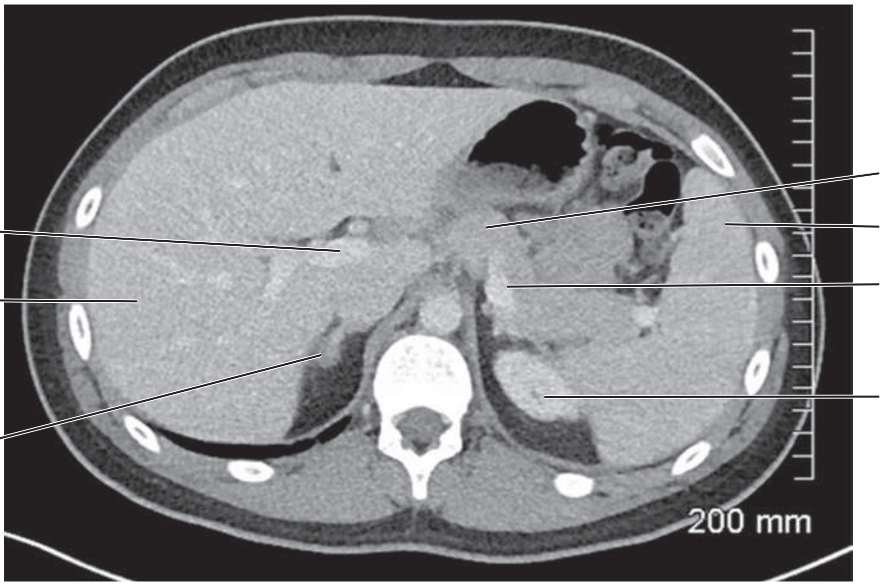
From cecum, ascending and right half of transverse colon, jejunum, and ileum to superior mesenteric lymph nodes

From kidneys, suprarenal glands, ureters, testis (male), and ovaries (female) to lateral aortic lymph nodes



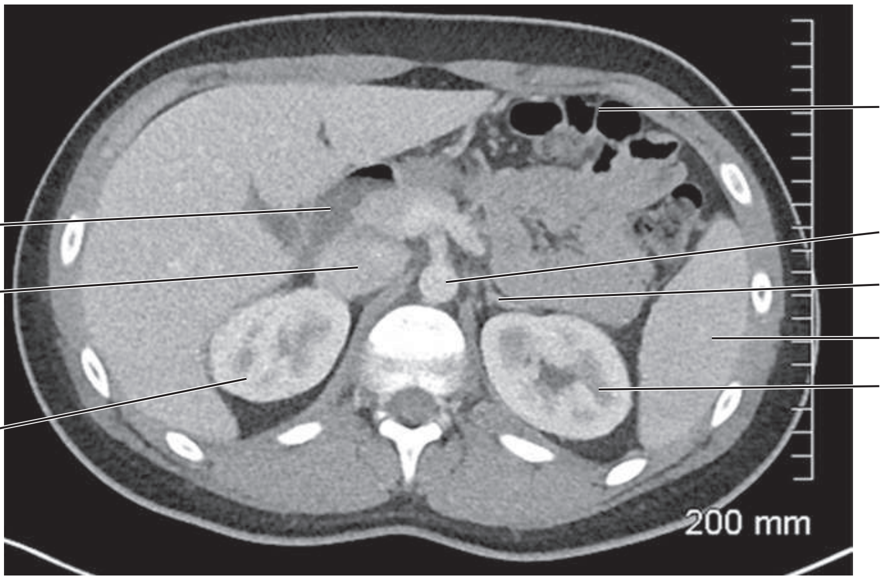
Axial CT image of abdomen with intravenous contrast enhancement

Hepatic portal vein
Liver
Aorta
Spinal canal
Stomach
Left diaphragm crus
Spleen
Vertebral body
200 mm



Axial CT image of upper abdomen with intravenous contrast enhancement

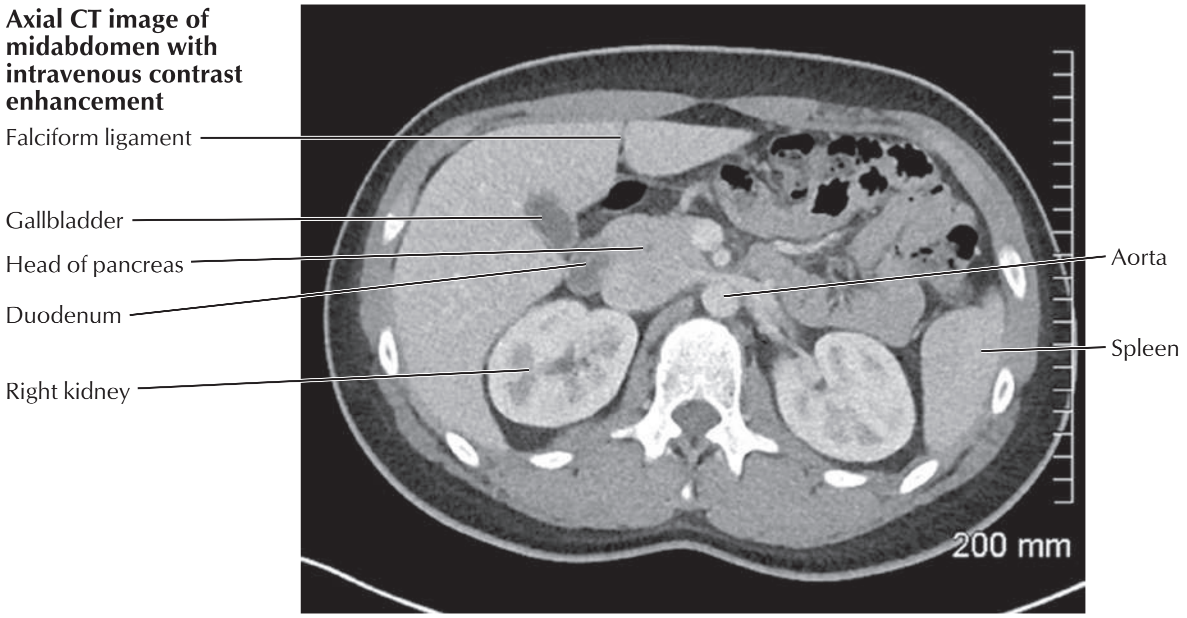
Hepatic portal vein
Liver
Right adrenal gland
Body of pancreas
Spleen
Splenic vein
Left suprarenal gland
200 mm



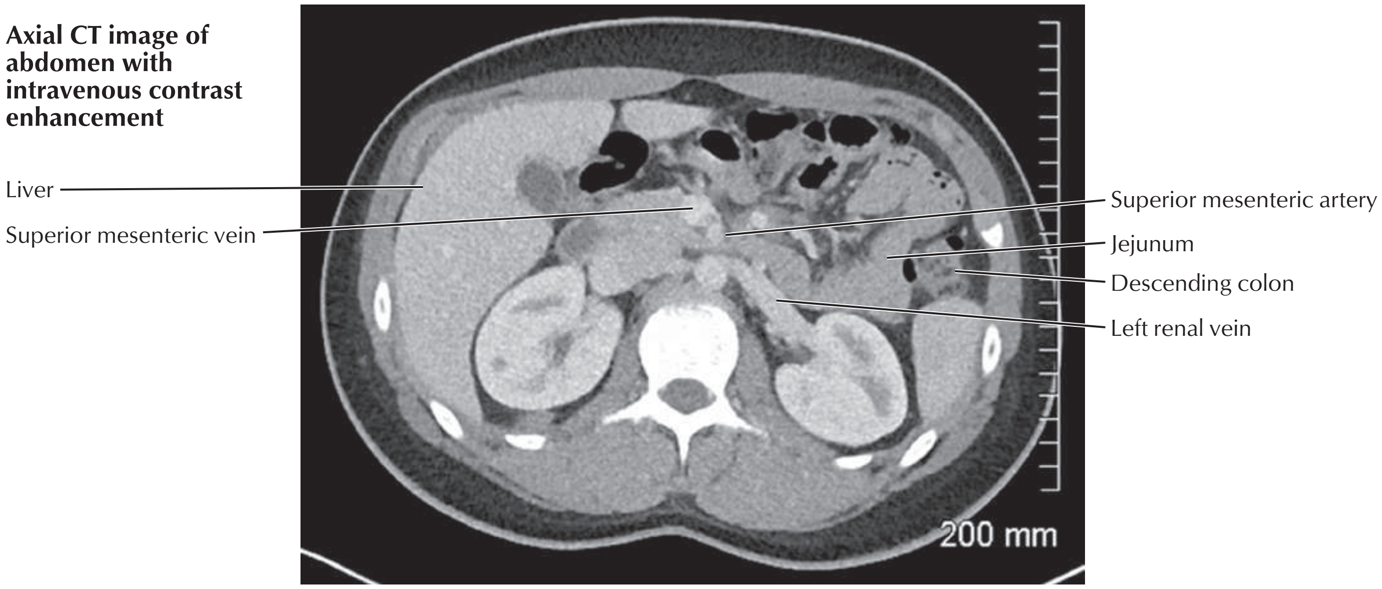
Axial CT image of midabdomen with intravenous contrast enhancement

Duodenum
Inferior vena cava
Right kidney
Colon, splenic flexure
Aorta
Left adrenal
Spleen
Left kidney
200 mm

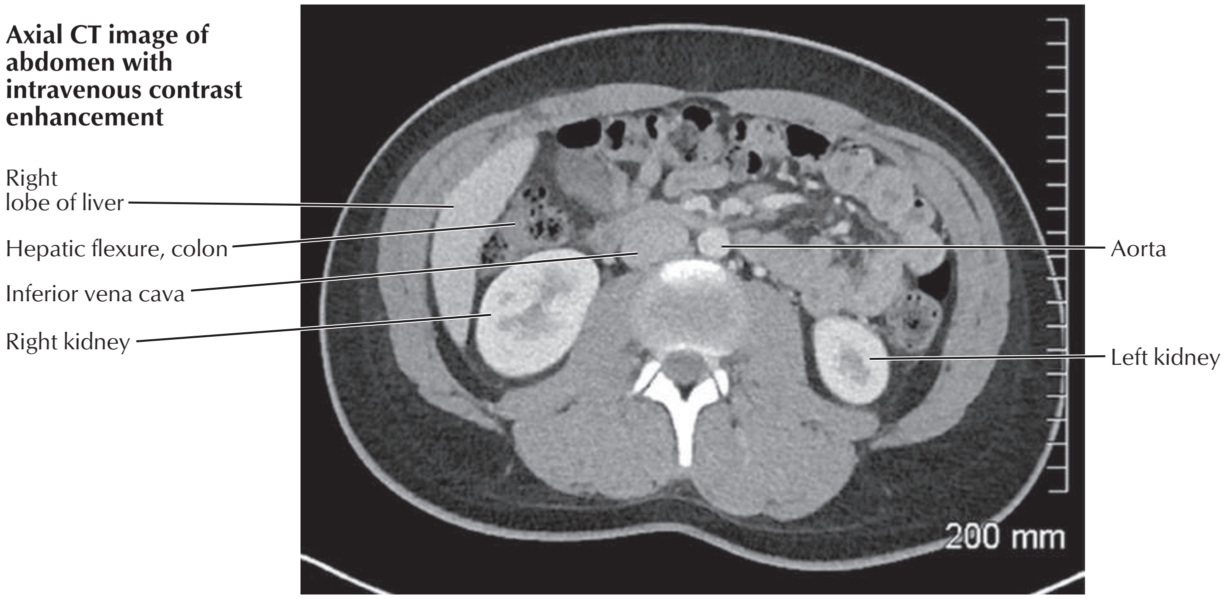
Axial CT image of midabdomen with intravenous contrast enhancement

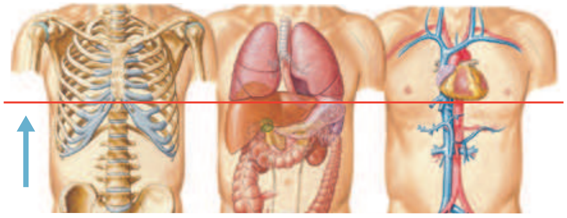

Falciform ligament
Gallbladder
Head of pancreas
Duodenum
Right kidney
Aorta
Spleen
200 mm

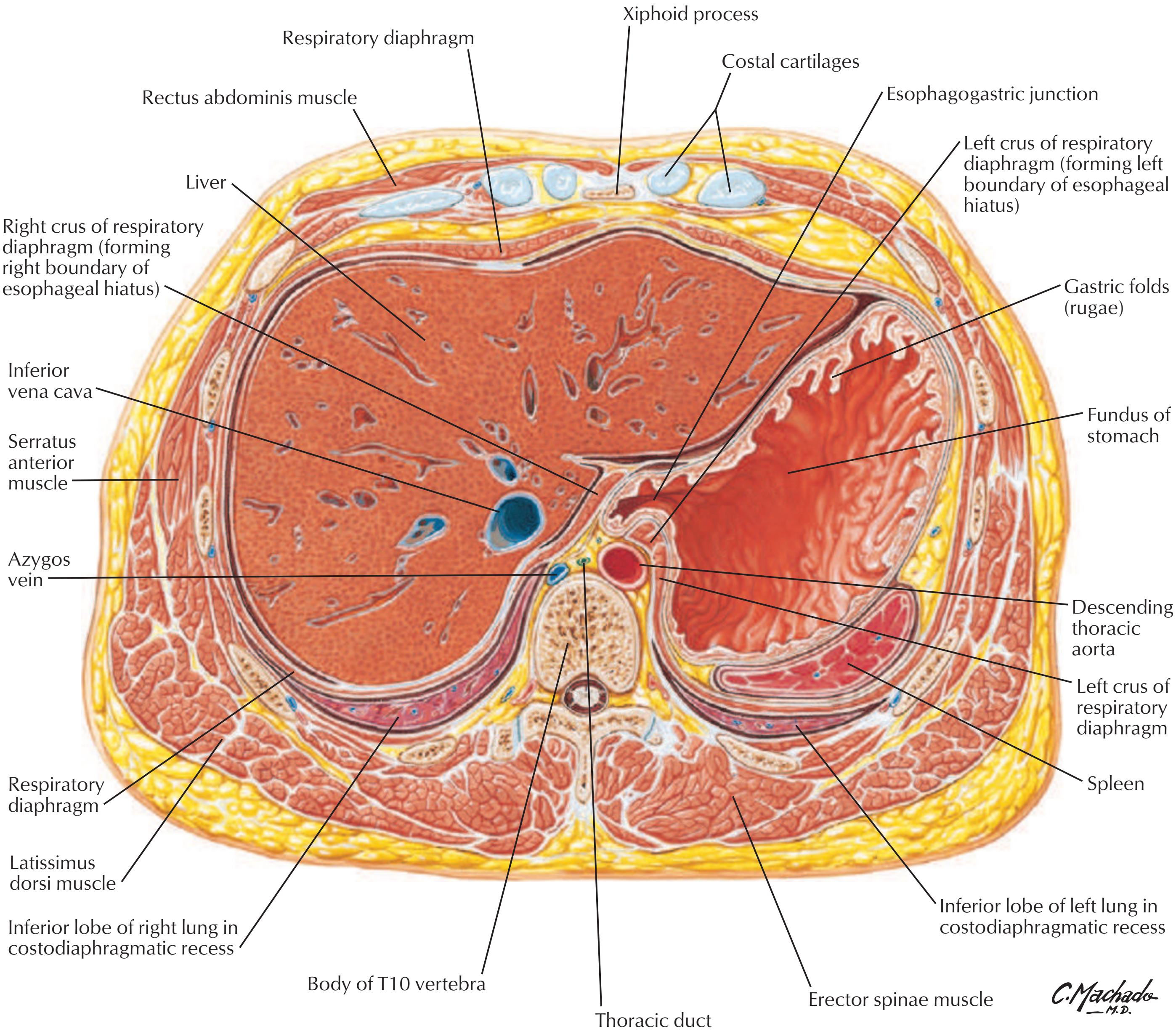
Axial CT image of abdomen with intravenous contrast enhancement


Liver
Superior mesenteric vein
Superior mesenteric artery
Jejunum
Descending colon
Left renal vein
200 mm

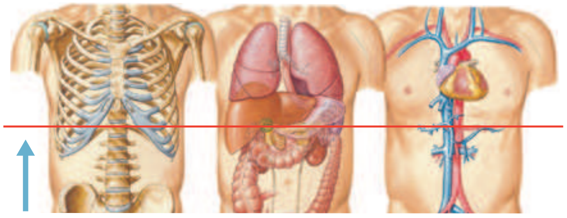
Axial CT image of abdomen with intravenous contrast enhancement

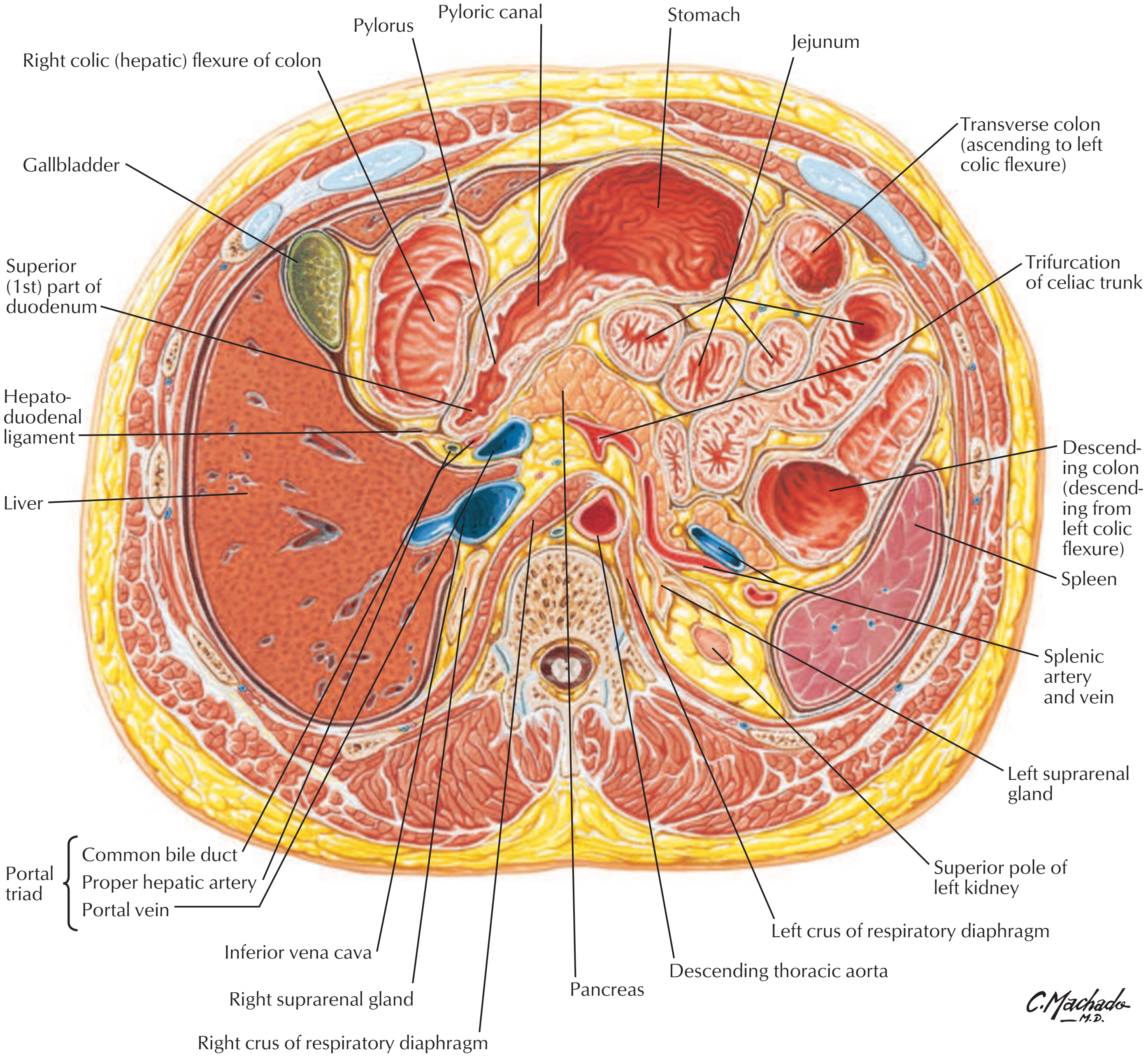

Right lobe of liver
Hepatic flexure, colon
Inferior vena cava
Right kidney
Aorta
Left kidney
200 mm



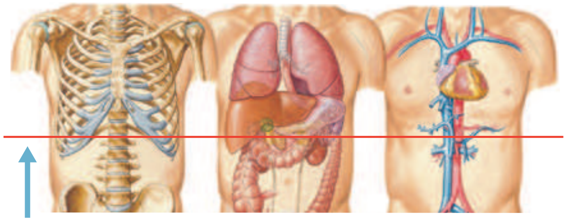

Xiphoid process
Respiratory diaphragm
Costal cartilages
Rectus abdominis muscle
Esophagogastric junction
Left crus of respiratory diaphragm (forming left boundary of esophageal hiatus)
Liver
Right crus of respiratory diaphragm (forming right boundary of esophageal hiatus)
Gastric folds (rugae)
Inferior vena cava
Fundus of stomach
Serratus anterior muscle
Azygos vein
Descending thoracic aorta
Left crus of respiratory diaphragm
Spleen
Respiratory diaphragm
Latissimus dorsi muscle
Inferior lobe of left lung in costodiaphragmatic recess
Inferior lobe of right lung in costodiaphragmatic recess
Body of T10 vertebra
Erector spinae muscle
Thoracic duct
C. Machado M.D.

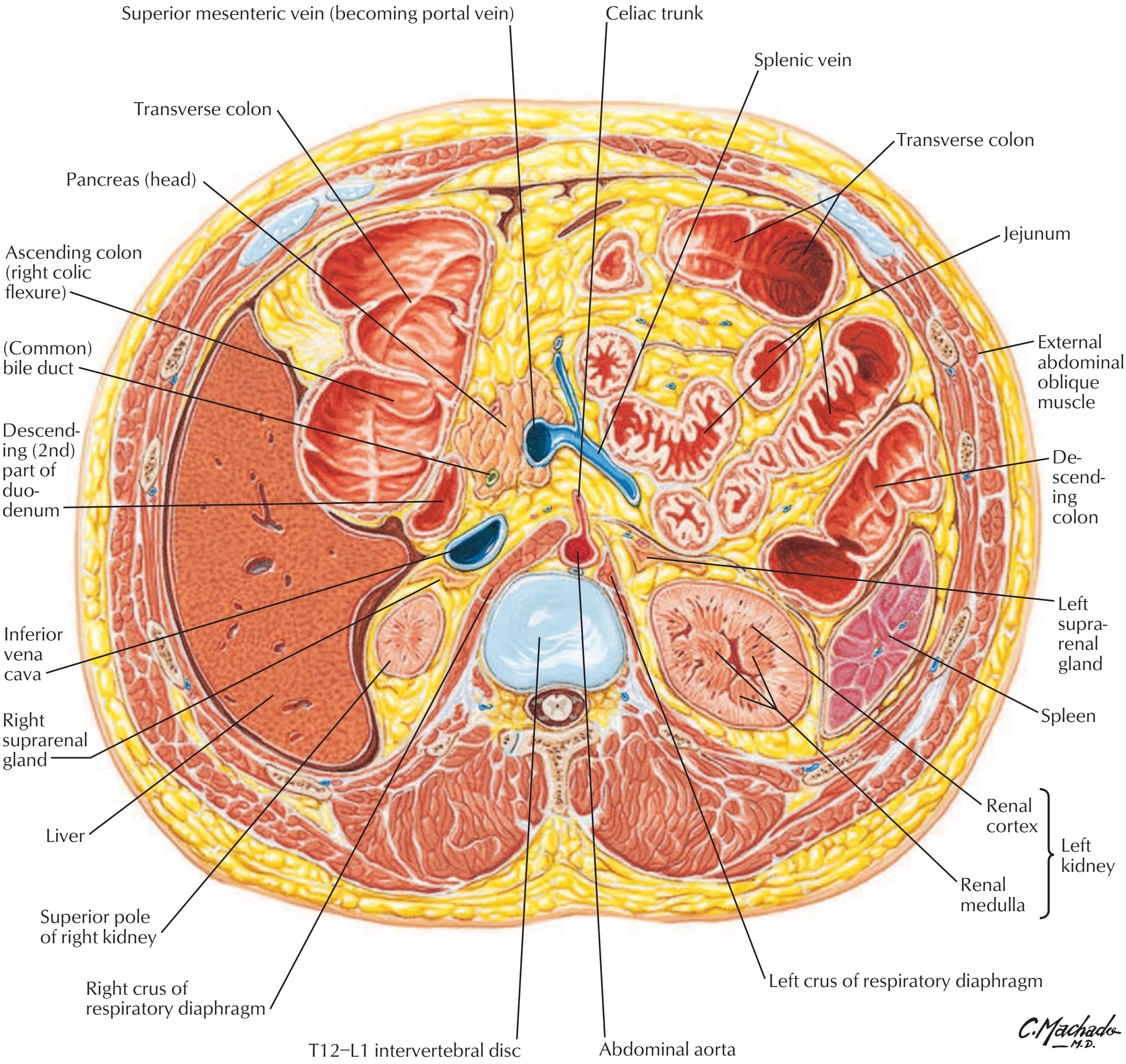
Cross Section at T12, Inferior to Xiphoid

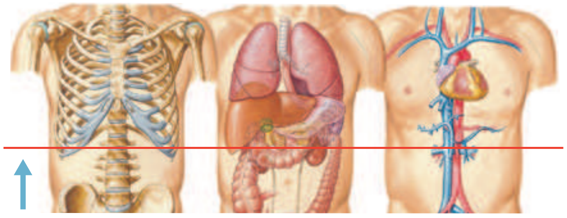


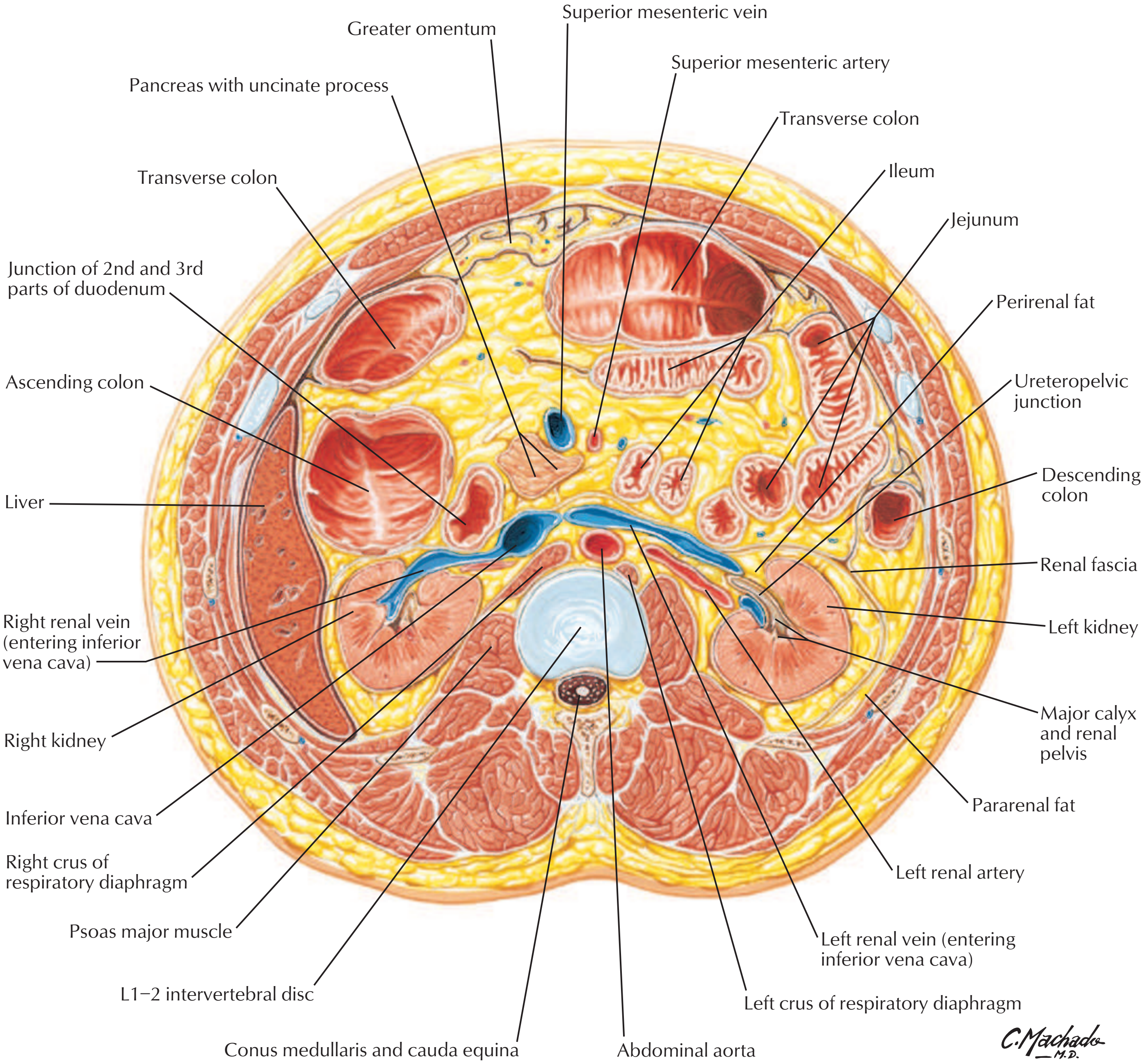

Pylorus
Pyloric canal
Stomach
Jejunum
Right colic (hepatic) flexure of colon
Transverse colon (ascending to left colic flexure)
Gallbladder
Trifurcation of celiac trunk
Superior (1st) part of duodenum
Hepato-duodenal ligament
Liver
Descending colon (descending from left colic flexure)
Spleen
Splenic artery and vein
Left suprarenal gland
Superior pole of left kidney
Portal triad
Common bile duct
Proper hepatic artery
Portal vein
Left crus of respiratory diaphragm
Inferior vena cava
Descending thoracic aorta
Right suprarenal gland
Pancreas
Right crus of respiratory diaphragm

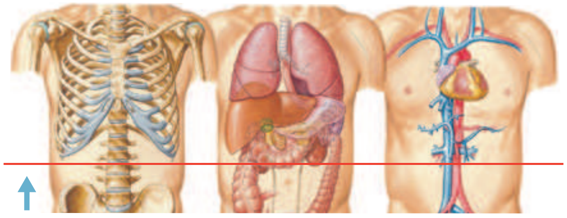
Cross Section at T12–L1, Intervertebral Disc

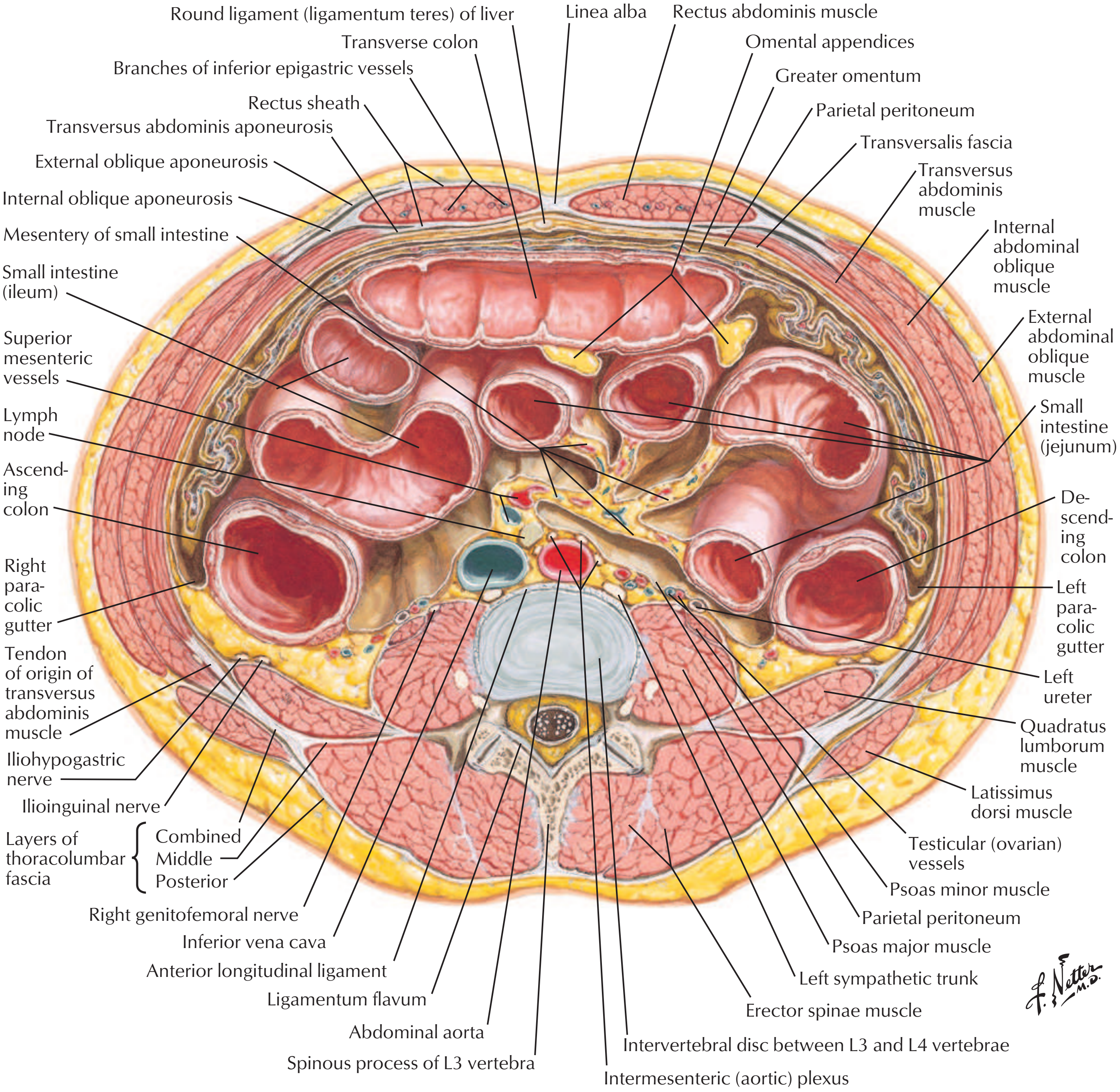



Superior mesenteric vein (becoming portal vein)
Celiac trunk
Splenic vein
Transverse colon
Transverse colon
Pancreas (head)
Jejunum
Ascending colon (right colic flexure)
(Common) bile duct
External abdominal oblique muscle
Descending (2nd) part of duodenum
Descending colon
Left suprarenal gland
Inferior vena cava
Spleen
Right suprarenal gland
Liver
Renal cortex
Left kidney
Renal medulla
Superior pole of right kidney
Left crus of respiratory diaphragm
Right crus of respiratory diaphragm
T12–L1 intervertebral disc
Abdominal aorta




Superior mesenteric vein
Greater omentum
Superior mesenteric artery
Pancreas with uncinate process
Transverse colon
Transverse colon
Ileum
Jejunum
Junction of 2nd and 3rd parts of duodenum
Perirenal fat
Ascending colon
Ureteropelvic junction
Descending colon
Liver
Renal fascia
Left kidney
Right renal vein (entering inferior vena cava)
Major calyx and renal pelvis
Right kidney
Pararenal fat
Inferior vena cava
Right crus of respiratory diaphragm
Left renal artery
Psoas major muscle
Left renal vein (entering inferior vena cava)
L1–2 intervertebral disc
Left crus of respiratory diaphragm
Conus medullaris and cauda equina
Abdominal aorta
C. Machado M.D.




Round ligament (ligamentum teres) of liver
Linea alba
Rectus abdominis muscle
Transverse colon
Omental appendices
Branches of inferior epigastric vessels
Greater omentum
Rectus sheath
Parietal peritoneum
Transversus abdominis aponeurosis
Transversalis fascia
External oblique aponeurosis
Transversus abdominis muscle
Internal oblique aponeurosis
Internal abdominal oblique muscle
Mesentery of small intestine
Small intestine (ileum)
External abdominal oblique muscle
Superior mesenteric vessels
Small intestine (jejunum)
Lymph node
Ascending colon
Descending colon
Right paracolic gutter
Left paracolic gutter
Tendon of origin of transversus abdominis muscle
Left ureter
Quadratus lumborum muscle
Iliohypogastric nerve
Latissimus dorsi muscle
Ilioinguinal nerve
Layers of thoracolumbar fascia
Combined
Middle
Posterior
Testicular (ovarian) vessels
Psoas minor muscle
Right genitofemoral nerve
Parietal peritoneum
Inferior vena cava
Psoas major muscle
Anterior longitudinal ligament
Left sympathetic trunk
Ligamentum flavum
Erector spinae muscle
Abdominal aorta
Intervertebral disc between L3 and L4 vertebrae
Spinous process of L3 vertebra
Intermesenteric (aortic) plexus

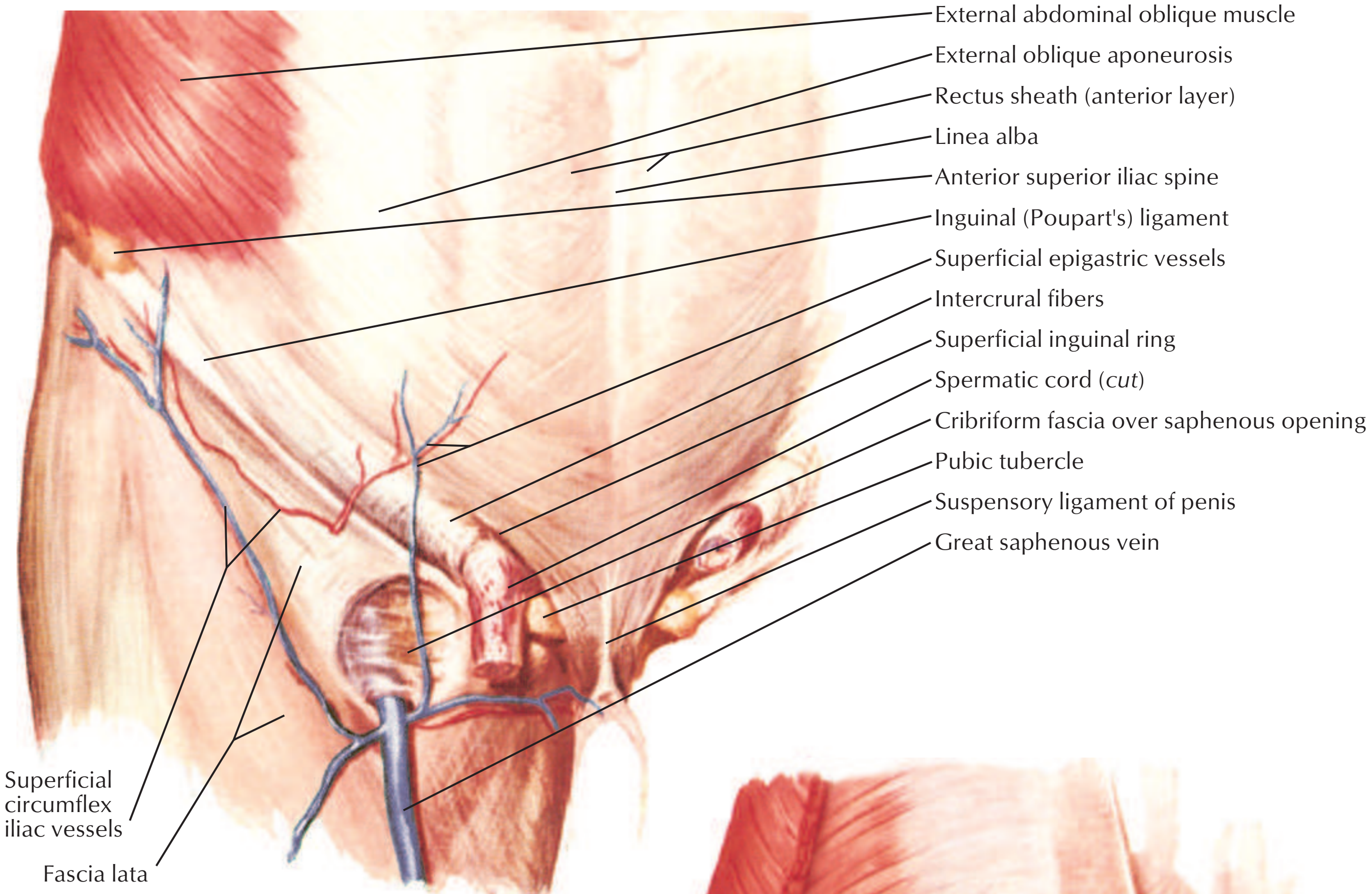
ANATOMICAL STRUCTURES	CLINICAL IMPORTANCE	PLATE NUMBERS
INTEGUMENTARY SYSTEM		
Umbilicus	Landmark for locating transumbilical plane, which is used to divide abdomen into quadrants; marks position of T10 dermatome; used to locate McBurney's point; common site for hernias in abdominal wall	249, 251
SKELETAL SYSTEM		
Xiphoid process, pubic symphysis	Palpable landmarks used to locate median plane, which is used to divide abdomen into quadrants	249
Anterior superior iliac spine (ASIS)	Palpable landmark used to located McBurney's point; tenderness over McBurney's point is indication of appendicitis	250, 282
MUSCULAR SYSTEM		
Linea alba	Site used for abdominal wall incisions because there is lack of significant neurovascular branches in this region	249, 254
Inguinal ligament	Surface landmark that marks division between abdominal wall and thigh	249, 253
Inguinal (Hesselbach's) triangle	Weak area on anterior abdominal wall where abdominal contents may herniate, producing direct inguinal hernia	256, 262
Deep (internal) inguinal ring	Opening on anterior abdominal wall where abdominal contents may herniate, producing indirect inguinal hernia	262, 263
Femoral ring	Opening medial to external iliac vessels where abdominal contents may herniate, producing femoral hernia	264
Esophageal hiatus of diaphragm	Widening of this opening allows stomach to protrude into mediastinum, causing gastroesophageal reflux	269, 271
DIGESTIVE SYSTEM		
Liver	Palpable inferior to right costal margin	270, 276
Gastroesophageal junction	Transient relaxations or decreased tone of lower esophageal sphincter can cause gastric esophageal reflux disease (GERD)	277, 328
Stomach, duodenum	Site of peptic ulcer formation	276, 277
Appendix	Prone to inflammation and rupture	280, 282
Colon	Common site of diverticula; colonoscopy is performed to screen for colon cancer	283
Gallbladder	Palpable at junction of right costal margin and midclavicular line; may become inflamed (cholecystitis) and cause pain; gallstones can block biliary ducts	284, 309
URINARY SYSTEM		
Kidney	Maintain fluid and electrolyte balance; may develop renal calculi (kidney stones)	314
ENDOCRINE SYSTEM		
Pancreas	Due to its retroperitoneal position, pain from pancreas is typically referred to the back; cancer of head of pancreas can compress common bile duct	288, 310

ANATOMICAL STRUCTURES	CLINICAL IMPORTANCE	PLATE NUMBERS
NERVOUS SYSTEM		
Ilioinguinal and genitofemoral nerves	Mediate cremasteric reflex, which tests integrity of L1 spinal nerve	269
Intercostal, subcostal, and iliohypogastric nerves	Convey well-localized pain sensations from abdominal wall and parietal peritoneum; pain in dermatomal distribution indicates problem with spinal nerves (e.g., herpes zoster infection)	260
Renal artery sympathetic fibers	Medically resistant hypertension can be treated in some patients by denervating sympathetic fibers traveling along renal arteries	300, 321
Celiac ganglion	Some patients with medically intractable pain from chronic pancreatitis undergo celiac ganglion block	301, 310
Sympathetic splanchnic nerves	Convey pain sensations from abdominal viscera that are often referred to other sites; quadrant in which pain is located and site of radiation provide clues to source of pain	303, 306
Iliohypogastric nerve	Nephrectomy through quadratus lumborum can damage iliohypogastric nerve, with resultant anesthesia above pubis	312
CARDIOVASCULAR SYSTEM		
Arterial anastomoses of anterior abdominal wall	Anastomosis between epigastric arteries and internal thoracic arteries and between circumflex arteries and intercostal and lateral thoracic arteries	258
Venous anastomoses of anterior abdominal wall	Anastomosis between epigastric veins and internal thoracic veins and between circumflex and thoracoepigastric veins and lateral thoracic veins	259
Paraumbilical veins	May become dilated in patients with portal hypertension, producing caput medusa	259, 299
Cystic artery	Ligated during cholecystectomy	291
Superior mesenteric artery	May compress 3rd part of duodenum in thin patient or patient who has recently lost a lot of weight	291, 294
Intestinal arteries	Areas without significant collateral circulation between major vessels (watershed areas) are at risk for ischemia	294, 295
Marginal artery anastomosis	Marginal artery connects right, middle, and left colic arteries, providing important anastomosis for collateral circulation	295
Esophageal veins	May become dilated with portal hypertension, resulting in esophageal varices	296, 299
Hepatic portal vein	Reduced blood flow through liver (e.g., due to cirrhosis) may produce portal hypertension and dilation of tributaries of portal vein; blood may return to heart at sites of portosystemic anastomosis	298, 299
Superior rectal vein	Has anastomoses with systemic rectal veins that may become dilated with portal hypertension	298, 299
Abdominal aorta	Common site for aneurysm in abdomen, especially inferior to renal arteries	317
LYMPHATIC SYSTEM		
Spleen	May be ruptured by fracture of ribs 9 to 11; splenic enlargement is assessed by palpation	273, 289

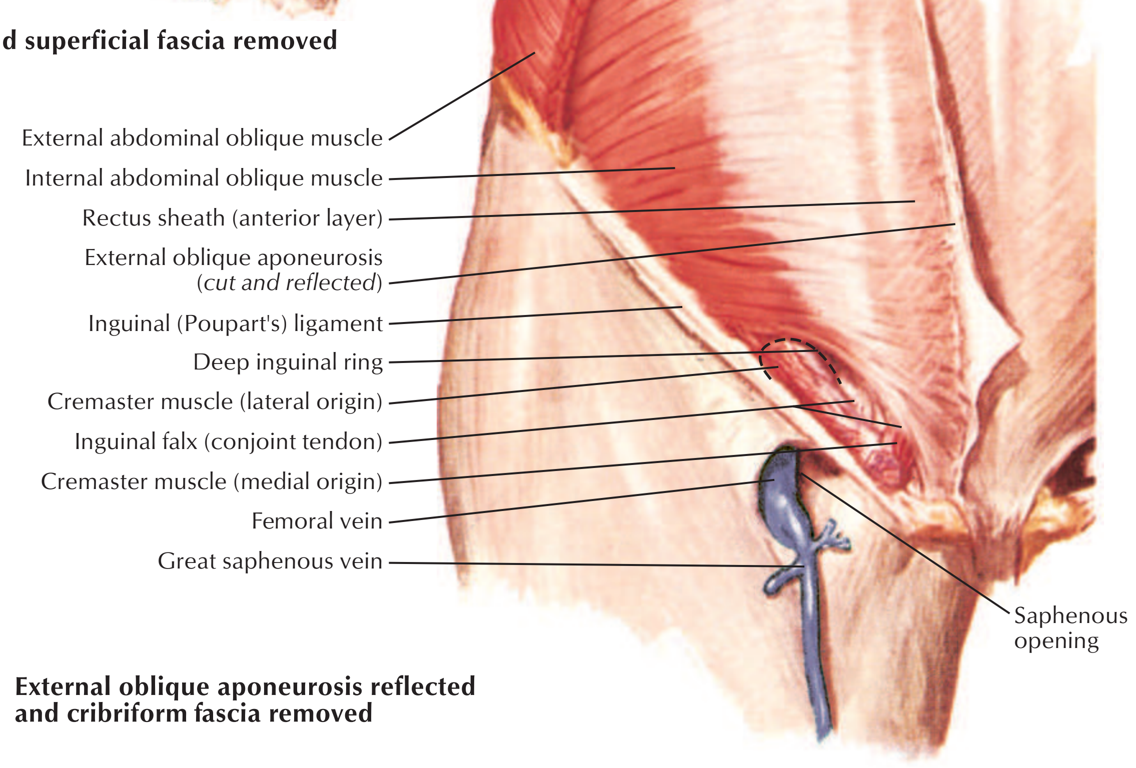
*Selections were based largely on clinical data as well as commonly covered clinical correlations in gross anatomy courses.

MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Respiratory diaphragm	Posterior abdominal wall	Xiphoid process, lower six costal cartilages, L1–L3 vertebrae	Converges into central tendon	Phrenic nerve	Pericardiacophrenic, musculophrenic, superior and inferior phrenic arteries	Draws central tendon down and forward during inspiration
External abdominal oblique	Anterior abdominal wall	External surfaces of ribs 5–12	Linea alba, pubic tubercle, anterior half of iliac crest	Anterior rami of six inferior thoracic nerves	Superior and inferior epigastric arteries	Compresses and supports abdominal viscera, flexes and rotates trunk
Internal abdominal oblique	Anterior abdominal wall	Thoracolumbar fascia, anterior 2/3 of iliac crest, lateral half of inguinal ligament	Inferior borders of ribs 10–12, linea alba, pubis via conjoint tendon	Anterior rami of six inferior thoracic and first lumbar nerves	Superior and inferior epigastric and deep circumflex iliac arteries	Compresses and supports abdominal viscera, flexes and rotates trunk
Psoas major	Posterior abdominal wall	Transverse processes of lumbar vertebrae, sides of bodies of T12–L5 vertebrae, intervening intervertebral discs	Lesser trochanter of femur	Anterior rami of first three lumbar nerves	Lumbar branches of iliolumbar artery	Acting superiorly with iliacus, flexes hip; acting inferiorly, flexes vertebral column laterally; used to balance trunk in sitting position; acting inferiorly with iliacus, flexes trunk
Psoas minor	Posterior abdominal wall	Vertebral margins of T12–L1 vertebrae, corresponding intervertebral disc	Pectineal line, iliopectineal eminence	Anterior rami of first lumbar nerve	Lumbar branch of iliolumbar artery	Flexes pelvis on vertebral column
Pyramidalis	Anterior abdominal wall	Body of pubis, anterior to rectus abdominis	Linea alba	Iliohypogastric nerve	Inferior epigastric artery	Tenses linea alba
Quadratus lumborum	Posterior abdominal wall	Medial half of inferior border of 12th rib, tips of lumbar transverse processes	Iliolumbar ligament, internal lip of iliac crest	Anterior rami of T12 and first four lumbar nerves	Iliolumbar artery	Extends and laterally flexes vertebral column, fixes 12th rib during inspiration
Rectus abdominis	Anterior abdominal wall	Pubic symphysis, pubic crest	Xiphoid process, costal cartilages 5–7	Anterior rami of six inferior thoracic nerves	Superior and interior epigastric arteries	Flexes trunk, compresses abdominal viscera
Transversus abdominis	Anterior abdominal wall	Internal surfaces of costal cartilages 7–12, thoracolumbar fascia, iliac crest, lateral third of inguinal ligament	Linea alba with aponeurosis of internal abdominal oblique, pubic crest, and pecten pubis via conjoint tendon	Anterior rami of six inferior thoracic and first lumbar nerves	Deep circumflex iliac and inferior epigastric arteries	Compresses and supports abdominal viscera

Variations in spinal nerve contributions to the innervation of muscles, their arterial supply, their attachments, and their actions are common themes in human anatomy. Therefore, expect differences between texts and realize that anatomical variation is normal.


External abdominal oblique muscle
External oblique aponeurosis
Rectus sheath (anterior layer)
Linea alba
Anterior superior iliac spine
Inguinal (Poupart's) ligament
Superficial epigastric vessels
Intercrural fibers
Superficial inguinal ring
Spermatic cord (*cut*)
Cribriform fascia over saphenous opening
Pubic tubercle
Suspensory ligament of penis
Great saphenous vein
Superficial circumflex iliac vessels
Fascia lata

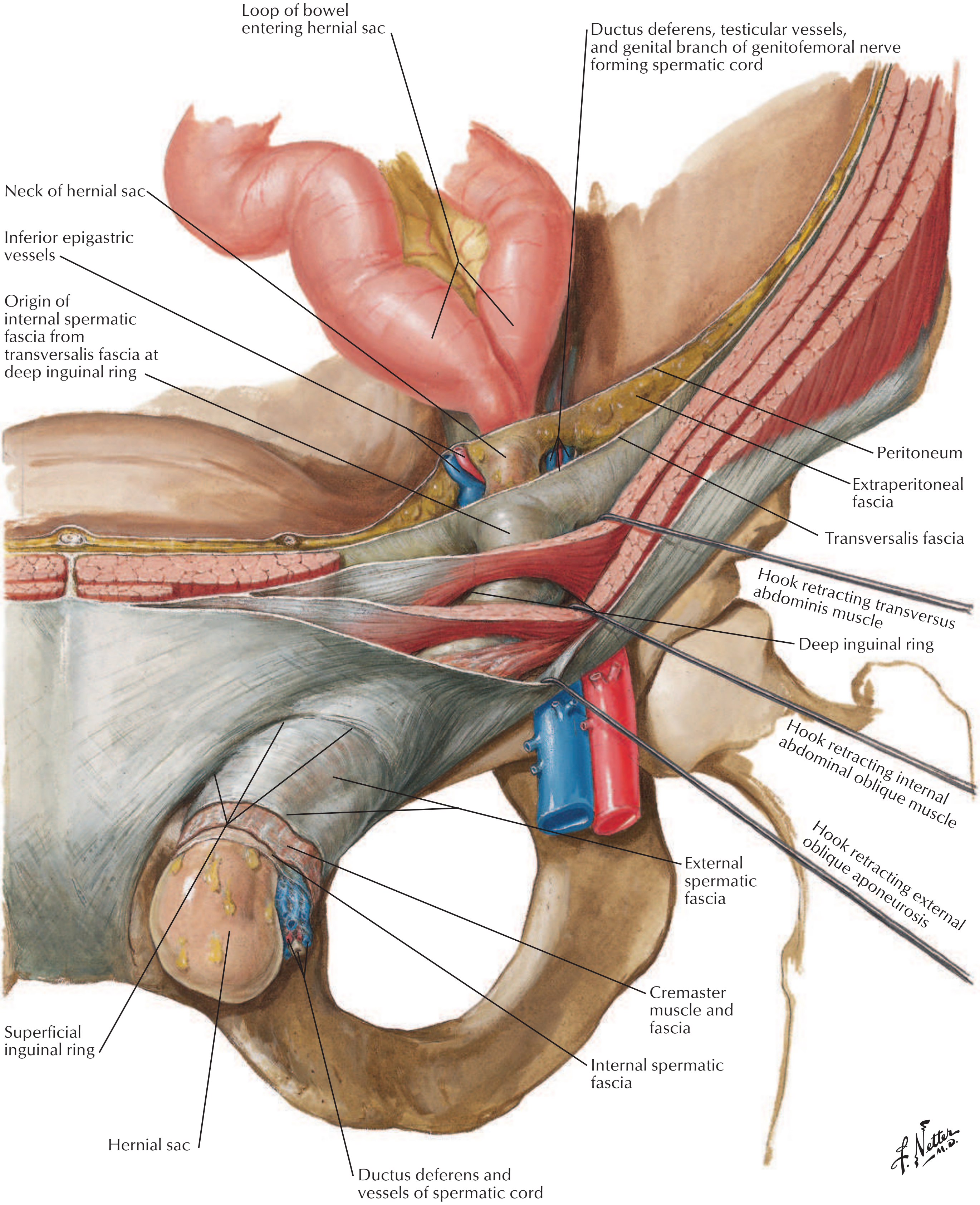
Skin and superficial fascia removed


External abdominal oblique muscle
Internal abdominal oblique muscle
Rectus sheath (anterior layer)
External oblique aponeurosis (*cut and reflected*)
Inguinal (Poupart's) ligament
Deep inguinal ring
Cremaster muscle (lateral origin)
Inguinal falx (conjoint tendon)
Cremaster muscle (medial origin)
Femoral vein
Great saphenous vein
Saphenous opening

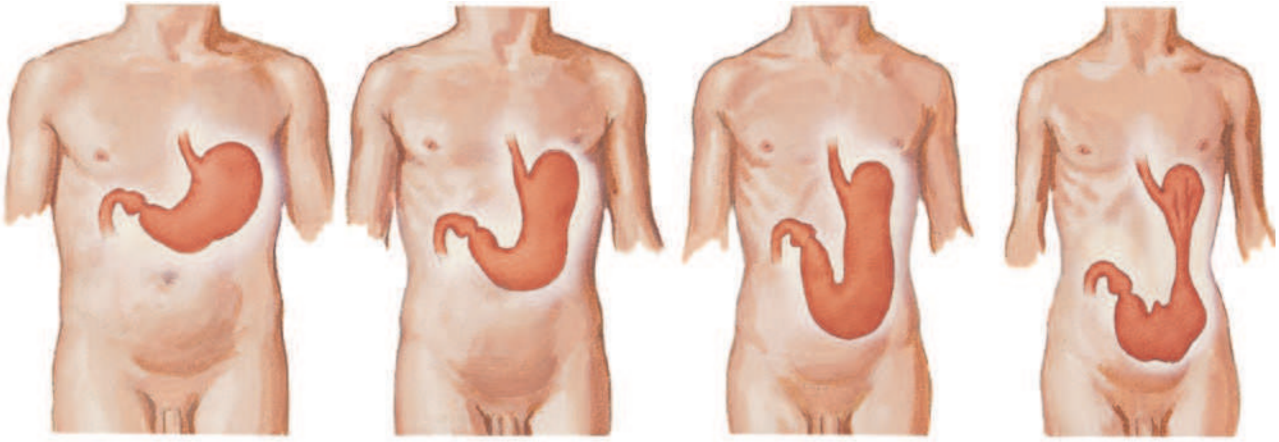
F. Netter M.D.

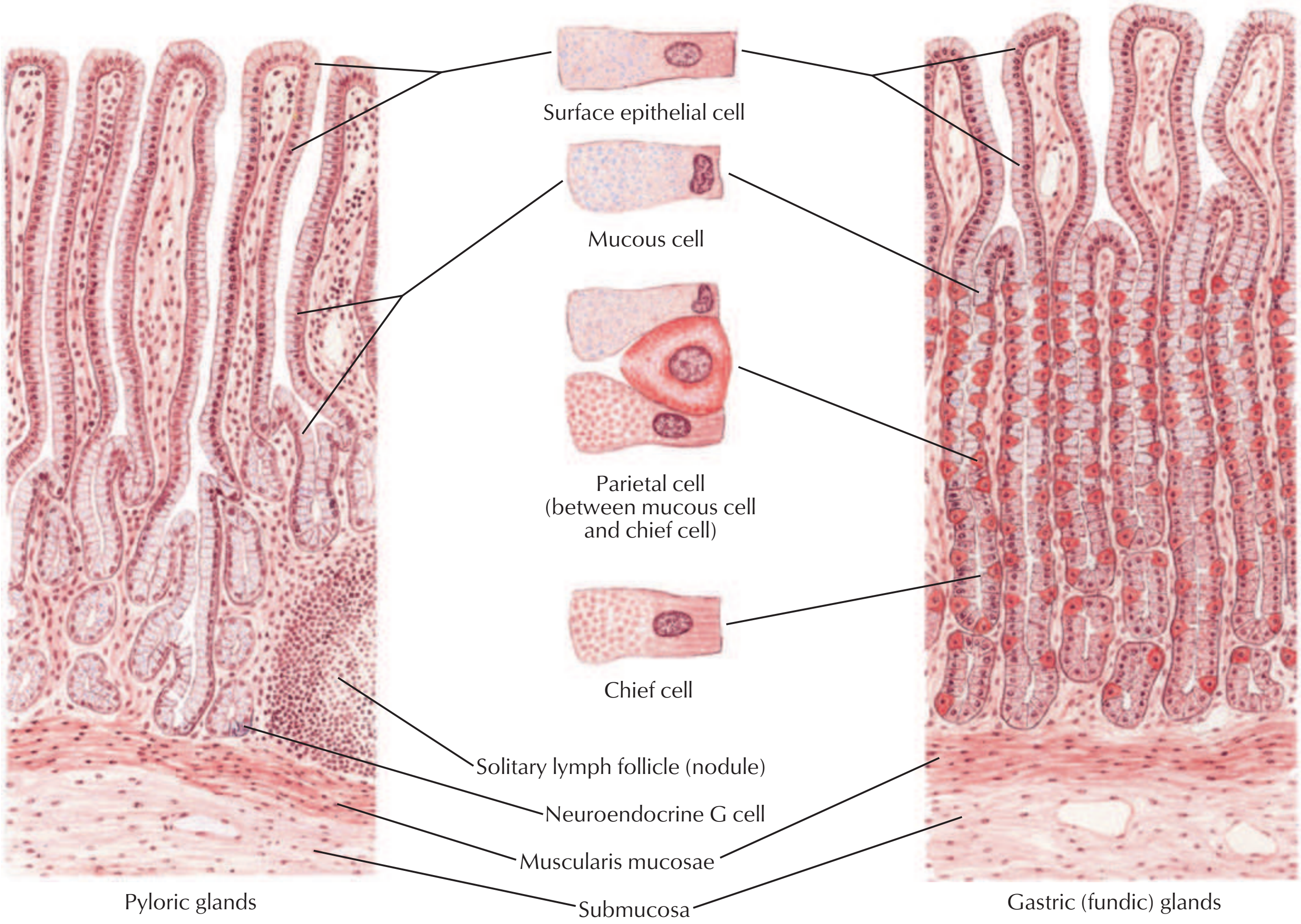
K. Marzejon

External oblique aponeurosis reflected and cribriform fascia removed

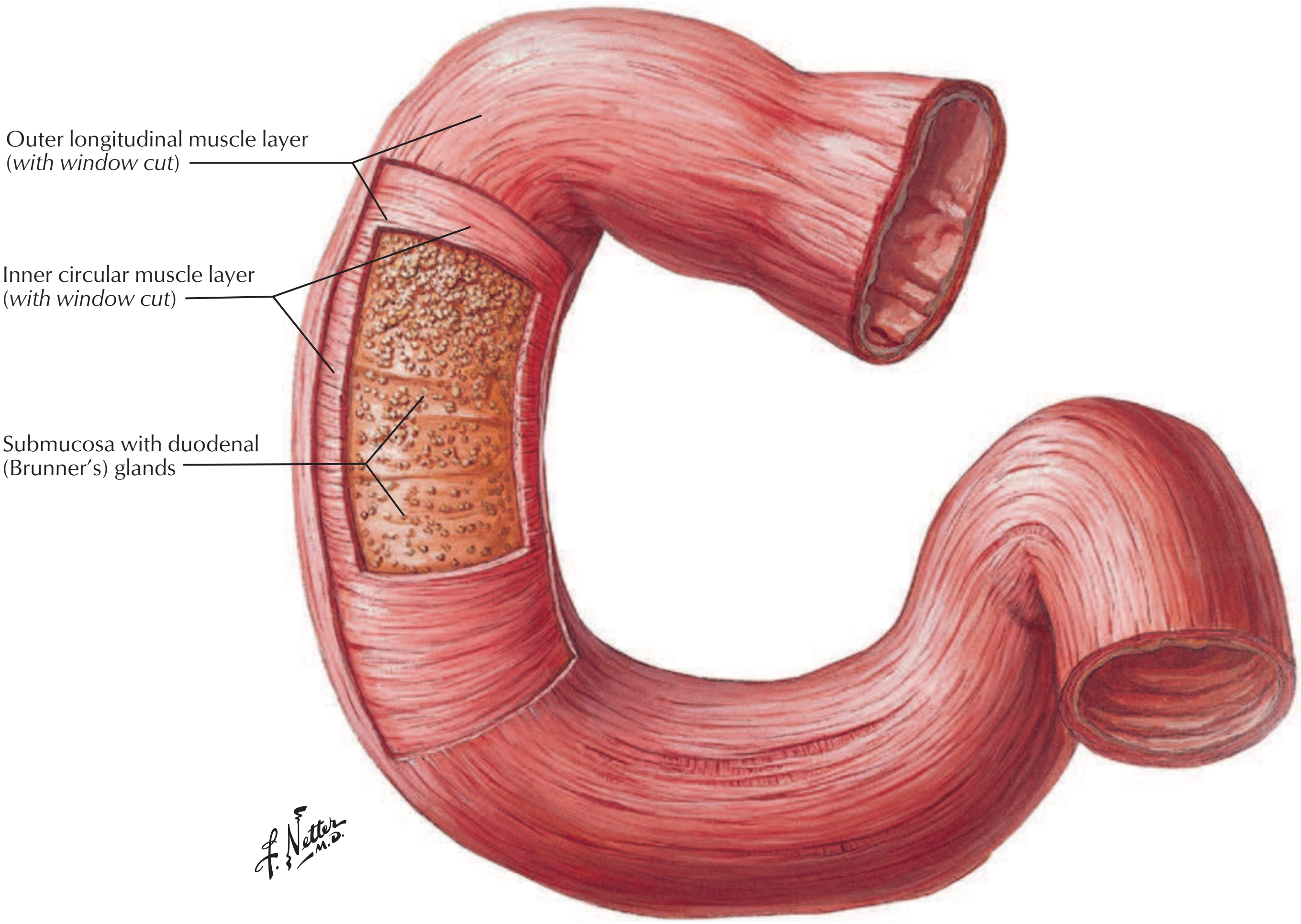

Loop of bowel entering hernial sac
Ductus deferens, testicular vessels, and genital branch of genitofemoral nerve forming spermatic cord
Neck of hernial sac
Inferior epigastric vessels
Origin of internal spermatic fascia from transversalis fascia at deep inguinal ring
Peritoneum
Extraperitoneal fascia
Transversalis fascia
Hook retracting transversus abdominis muscle
Deep inguinal ring
Hook retracting internal abdominal oblique muscle
Hook retracting external oblique aponeurosis
External spermatic fascia
Cremaster muscle and fascia
Internal spermatic fascia
Superficial inguinal ring
Hernial sac
Ductus deferens and vessels of spermatic cord

Variations in position and contour of stomach in relation to body habitus

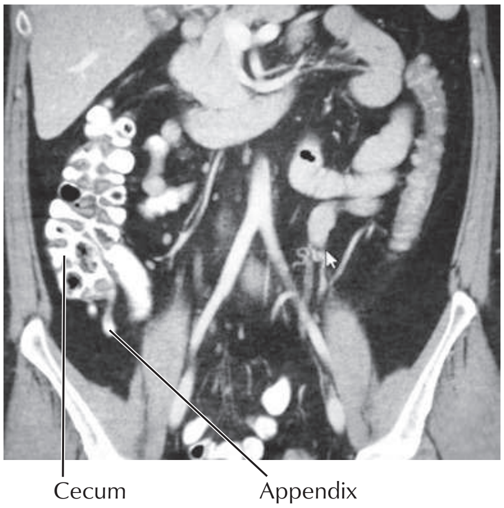

Hypertonic stomach
Orthotonic stomach
Hypotonic stomach
Atonic stomach


Surface epithelial cell
Mucous cell
Parietal cell (between mucous cell and chief cell)
Chief cell
Solitary lymph follicle (nodule)
Neuroendocrine G cell
Muscularis mucosae
Submucosa
Pyloric glands
Gastric (fundic) glands

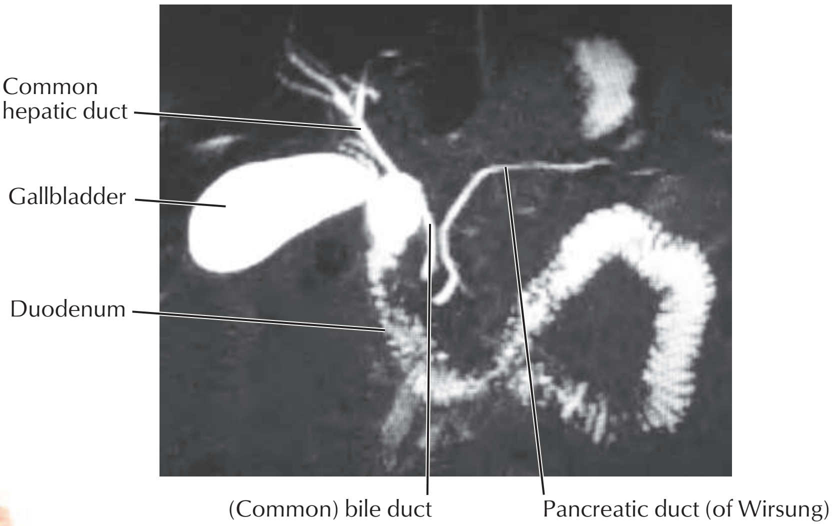
Layers of Duodenal Wall

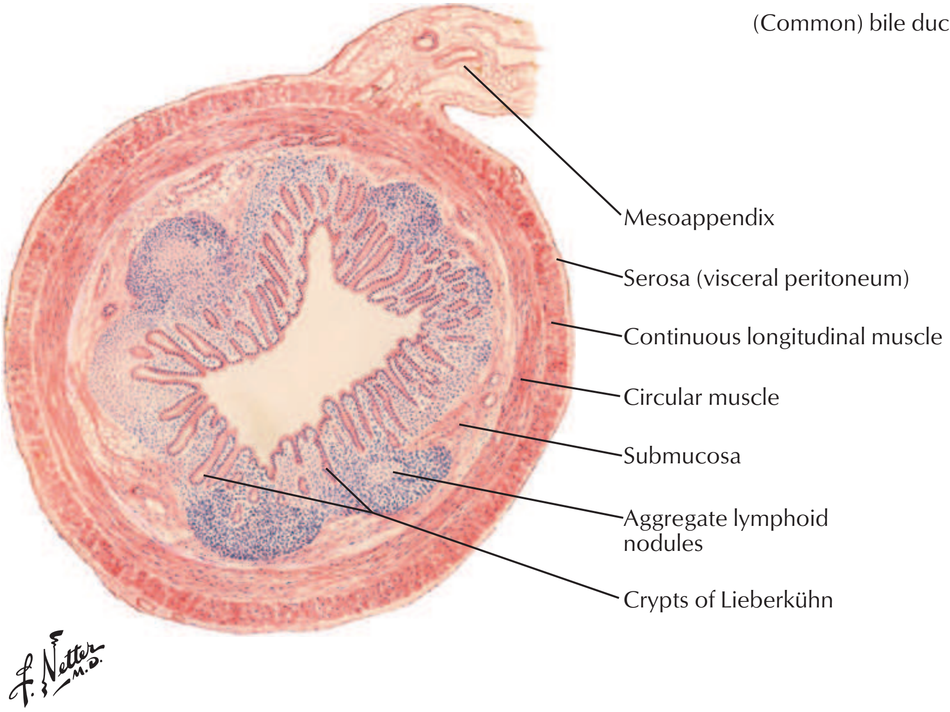

Outer longitudinal muscle layer
(*with window cut*)
Inner circular muscle layer
(*with window cut*)
Submucosa with duodenal
(Brunner's) glands

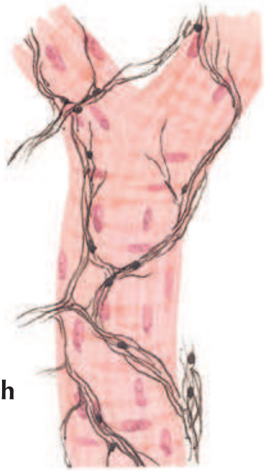
Coronal CT image with contrast


Cecum
Appendix

Magnetic resonance cholangiopancreatography (MRCP)

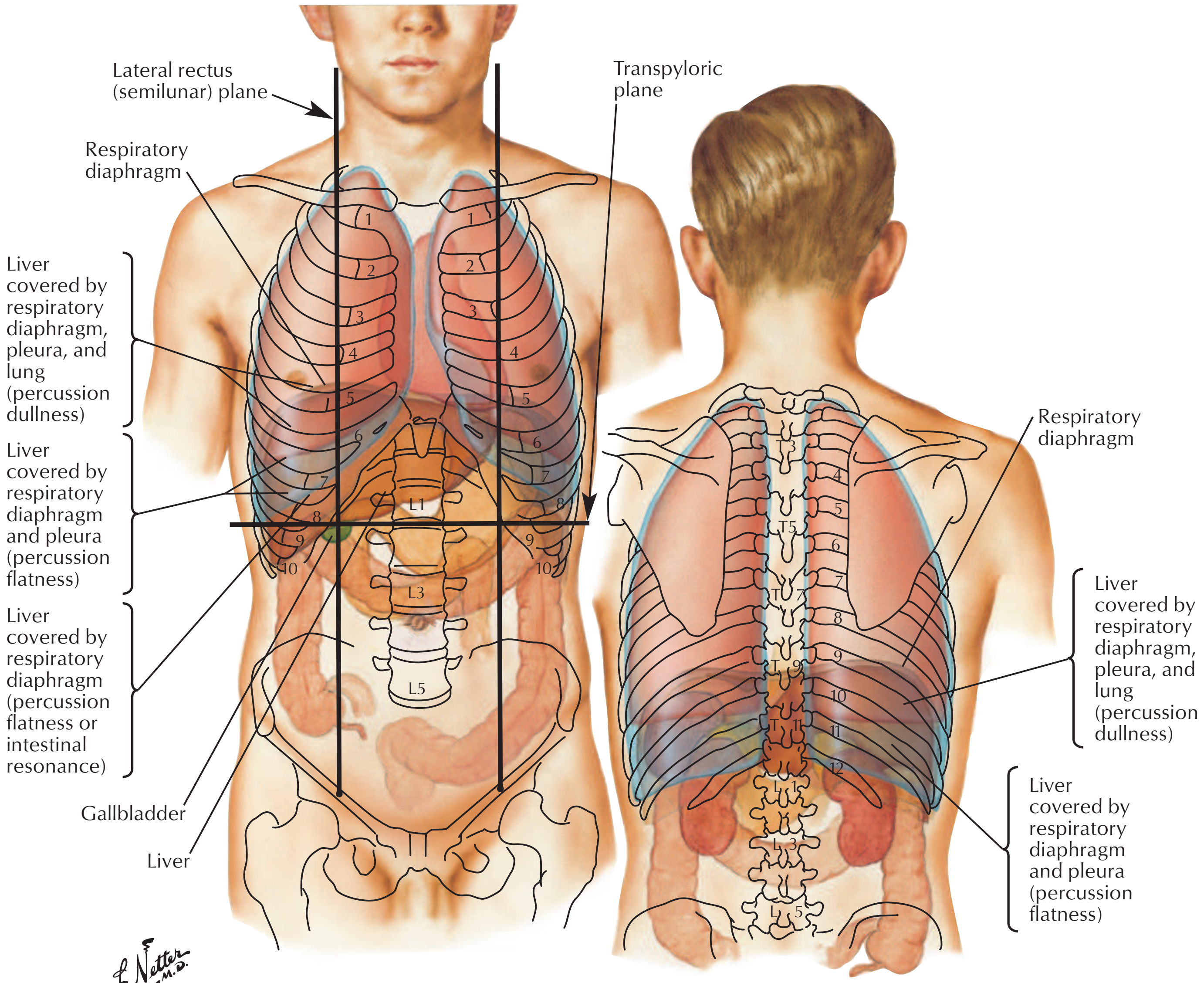

Common hepatic duct
Gallbladder
Duodenum
(Common) bile duct
Pancreatic duct (of Wirsung)

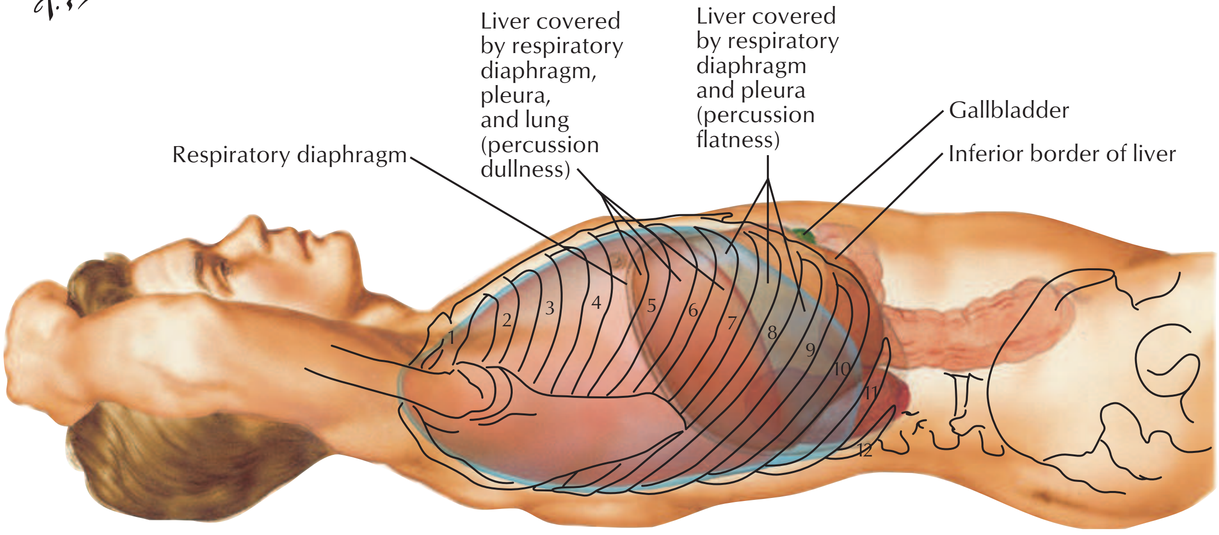

Mesoappendix
Serosa (visceral peritoneum)
Continuous longitudinal muscle
Circular muscle
Submucosa
Aggregate lymphoid nodules
Crypts of Lieberkühn
F. Netter M.D.

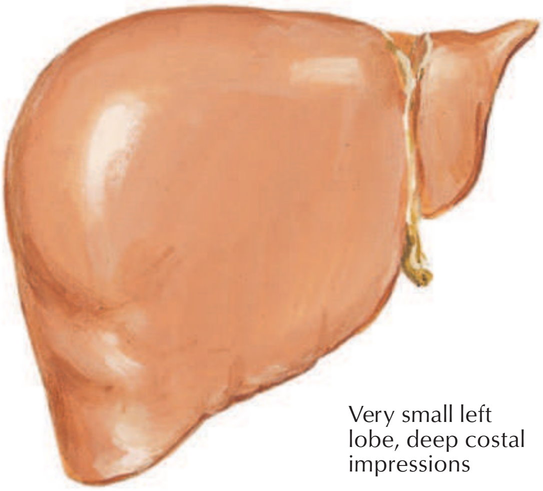


Ramification of nerve fibers around fine branch of hepatic artery

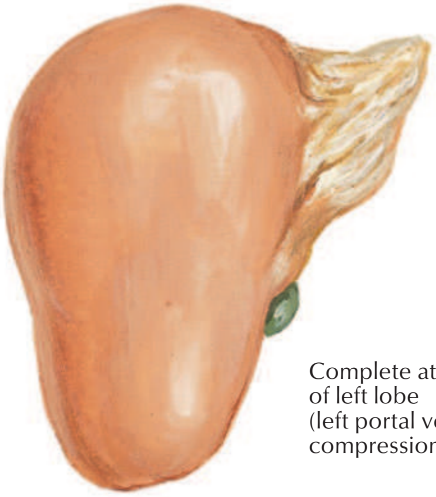
Topography of Liver


Lateral rectus (semilunar) plane
Transpyloric plane
Respiratory diaphragm
Liver covered by respiratory diaphragm, pleura, and lung (percussion dullness)
Liver covered by respiratory diaphragm and pleura (percussion flatness)
Liver covered by respiratory diaphragm (percussion flatness or intestinal resonance)
Gallbladder
Liver
1
2
3
4
5
6
7
8
9
10
1
2
3
4
5
6
7
8
9
10
L1
L3
L5
Respiratory diaphragm
Liver covered by respiratory diaphragm, pleura, and lung (percussion dullness)
Liver covered by respiratory diaphragm and pleura (percussion flatness)
T3
4
T5
5
6
T7
7
8
T9
9
10
T11
11
12
L1
L3
L5

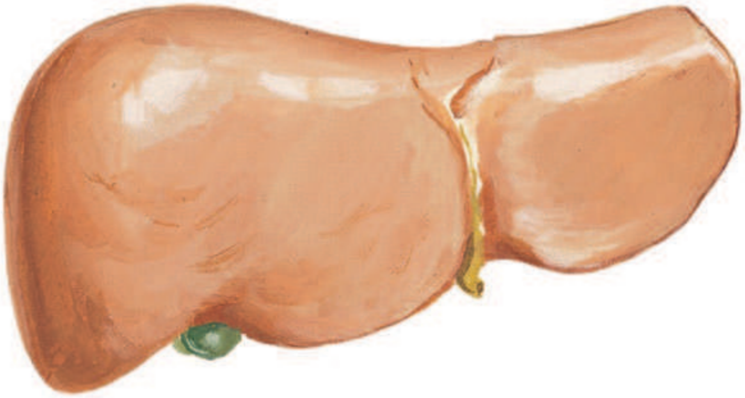

Respiratory diaphragm
Liver covered by respiratory diaphragm, pleura, and lung (percussion dullness)
Liver covered by respiratory diaphragm and pleura (percussion flatness)
Gallbladder
Inferior border of liver
1
2
3
4
5
6
7
8
9
10
11
12



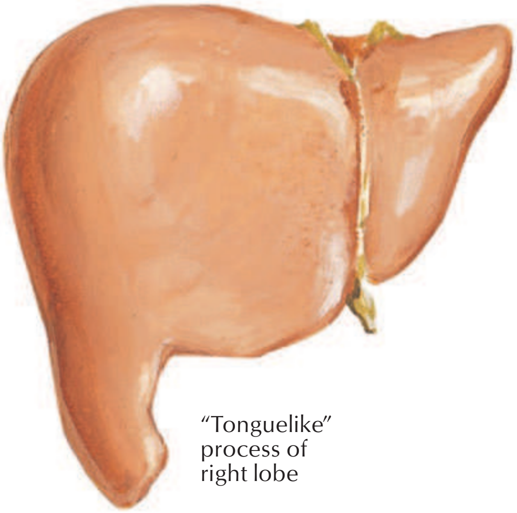
Very small left lobe, deep costal impressions



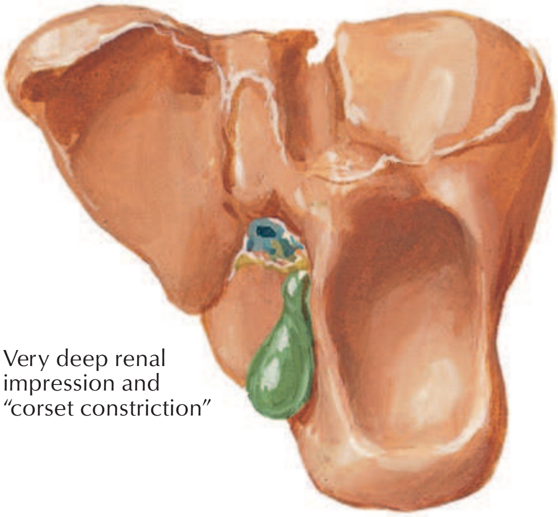
Complete atrophy of left lobe (left portal vein compression)



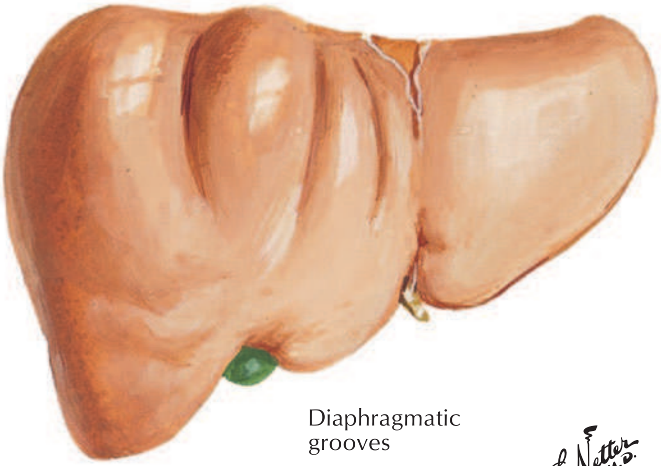
Transverse, “saddlelike” liver, relatively large left lobe



“Tonguelike” process of right lobe

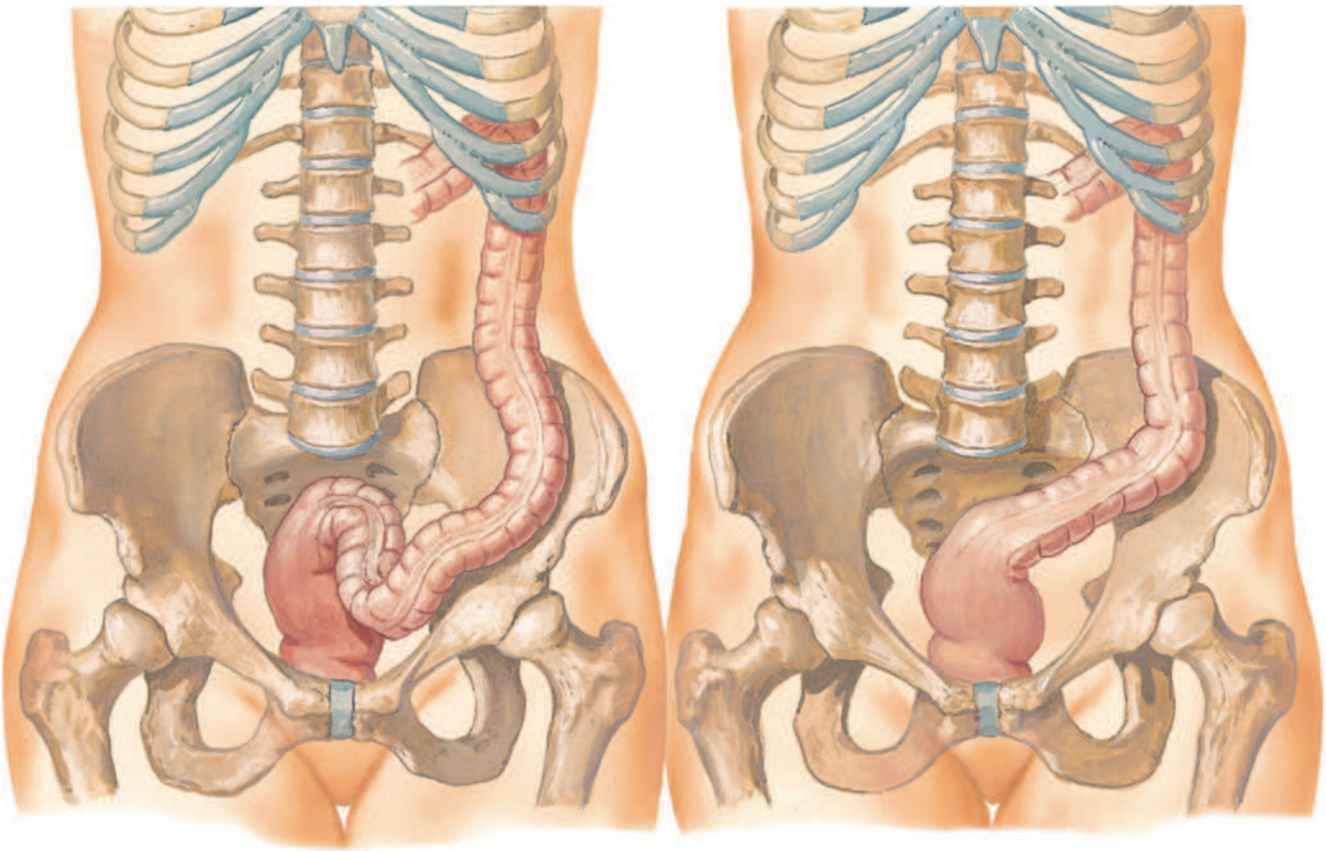


Very deep renal impression and “corset constriction”



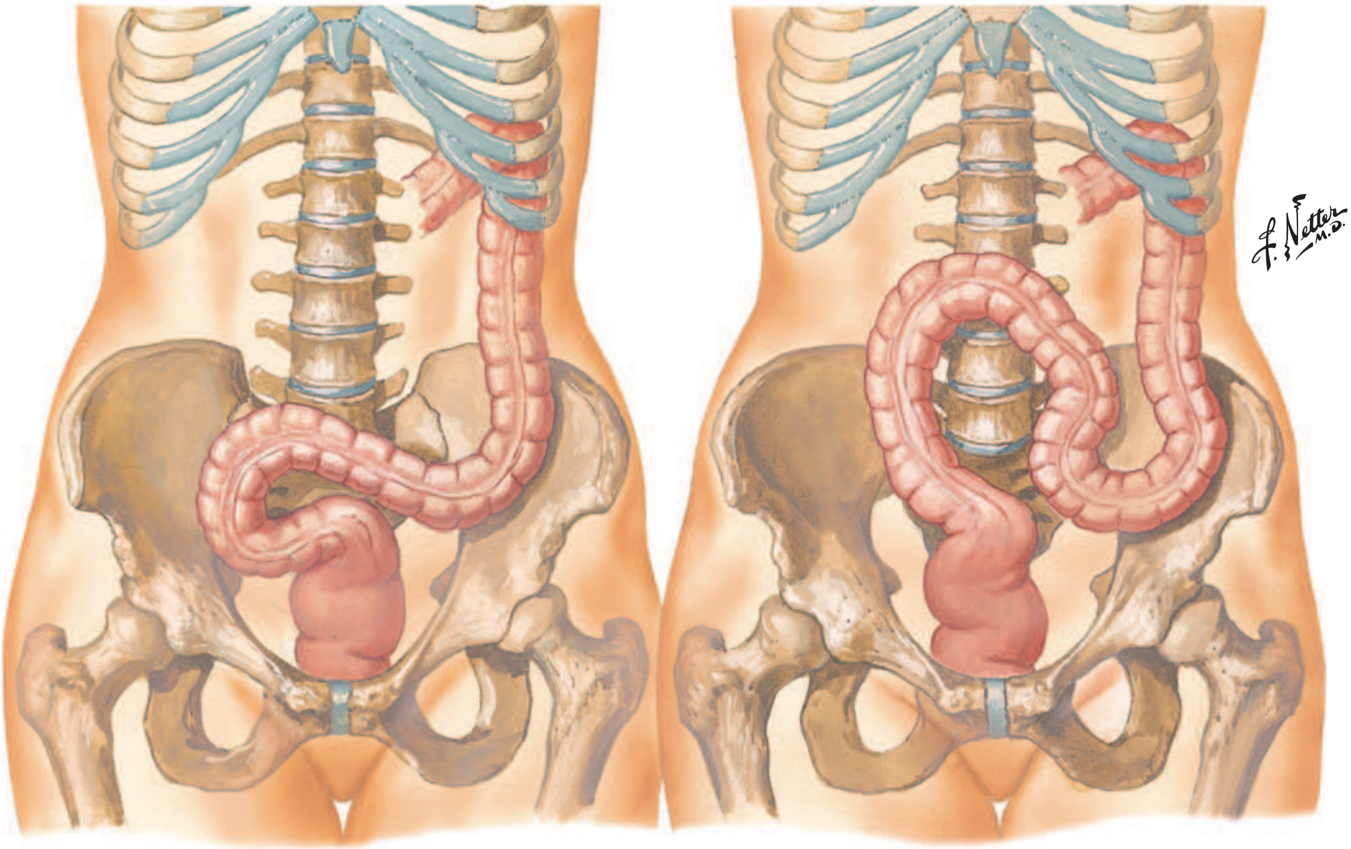
Diaphragmatic grooves

Sigmoid Colon: Variations in Position



Typical

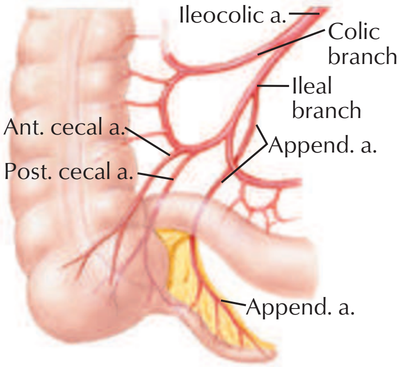
Short, straight, obliquely into pelvis



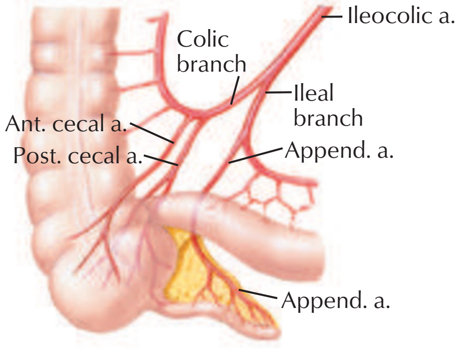
Looping to right side

Ascending high into abdomen

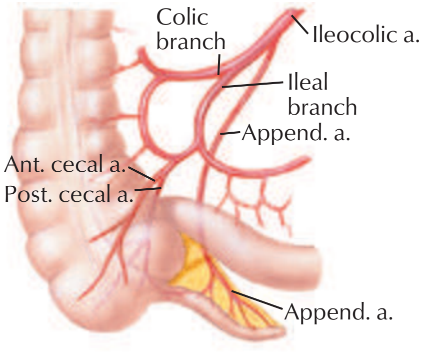
Variations in Arterial Supply to Cecum and Posterior Peritoneal Attachment of Cecum


Ileocolic a.
Colic branch
Ileal branch
Ant. cecal a.
Append. a.
Post. cecal a.
Append. a.

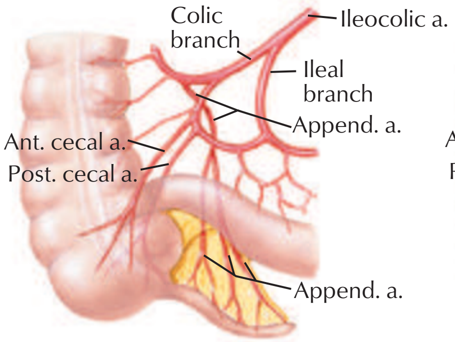
Anterior cecal and posterior cecal arteries originate from arcade between colic and ileal branches of ileocolic appendicular artery from ileal branch


Ileocolic a.
Colic branch
Ileal branch
Ant. cecal a.
Post. cecal a.
Append. a.
Append. a.

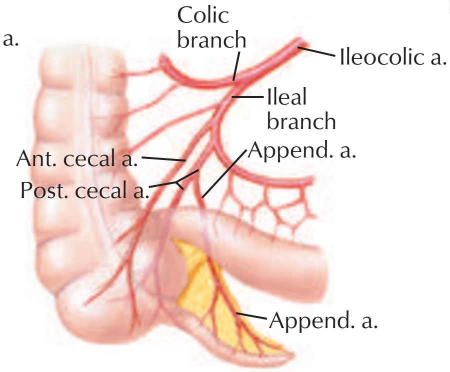
Anterior cecal and posterior cecal arteries originate from colic branch; appendicular artery from ileal branch of ileocolic artery


Colic branch
Ileocolic a.
Ileal branch
Append. a.
Ant. cecal a.
Post. cecal a.
Append. a.

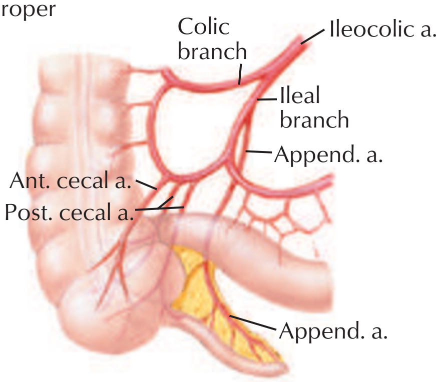
Anterior cecal and posterior cecal arteries have common origin from arcade; appendicular artery from ileocolic artery proper


Colic branch
Ileocolic a.
Ileal branch
Append. a.
Ant. cecal a.
Post. cecal a.
Append. a.

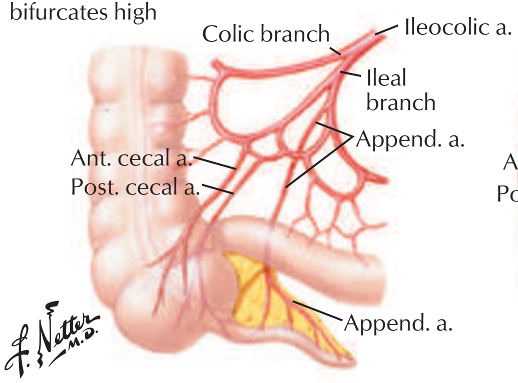
Anterior cecal and posterior cecal arteries originate from arcade between colic and ileal branches of ileocolic artery; appendicular artery from colic branch bifurcates high


Colic branch
Ileocolic a.
Ileal branch
Append. a.
Ant. cecal a.
Post. cecal a.
Append. a.

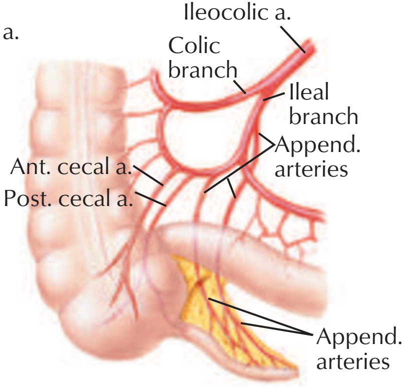
Anterior cecal and posterior cecal arteries originate from ileal branch of ileocolic artery; appendicular artery from posterior cecal


Colic branch
Ileocolic a.
Ileal branch
Append. a.
Ant. cecal a.
Post. cecal a.
Append. a.

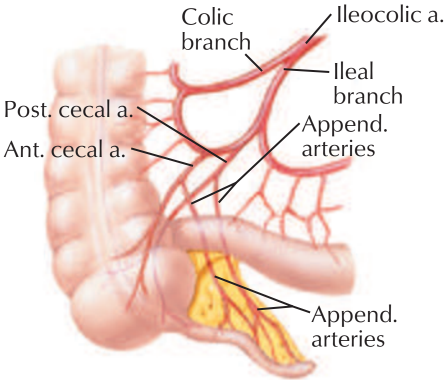
Anterior cecal and two posterior cecal arteries originate from arcade; appendicular artery from ileal branch of ileocolic artery


Colic branch
Ileocolic a.
Ileal branch
Append. a.
Ant. cecal a.
Post. cecal a.
Append. a.

Multiple arcades between ileal branch and colic branch of ileocolic artery. Anterior cecal and posterior cecal arteries originate from these arcades; appendicular artery from ileal branch

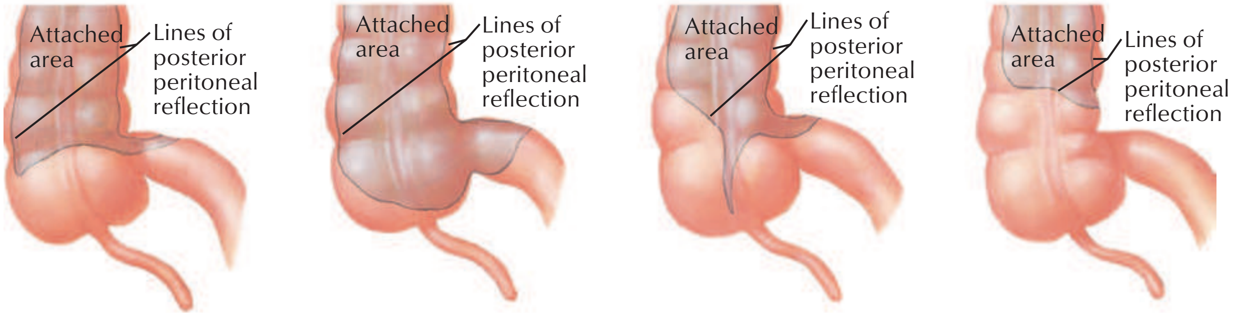

Ileocolic a.
Colic branch
Ileal branch
Append. arteries
Ant. cecal a.
Post. cecal a.
Append. arteries

Anterior cecal and posterior cecal arteries originate from arcade between colic and ileal branches of ileocolic artery; two appendicular arteries, one deriving from arcade, the other from ileal branch, are present

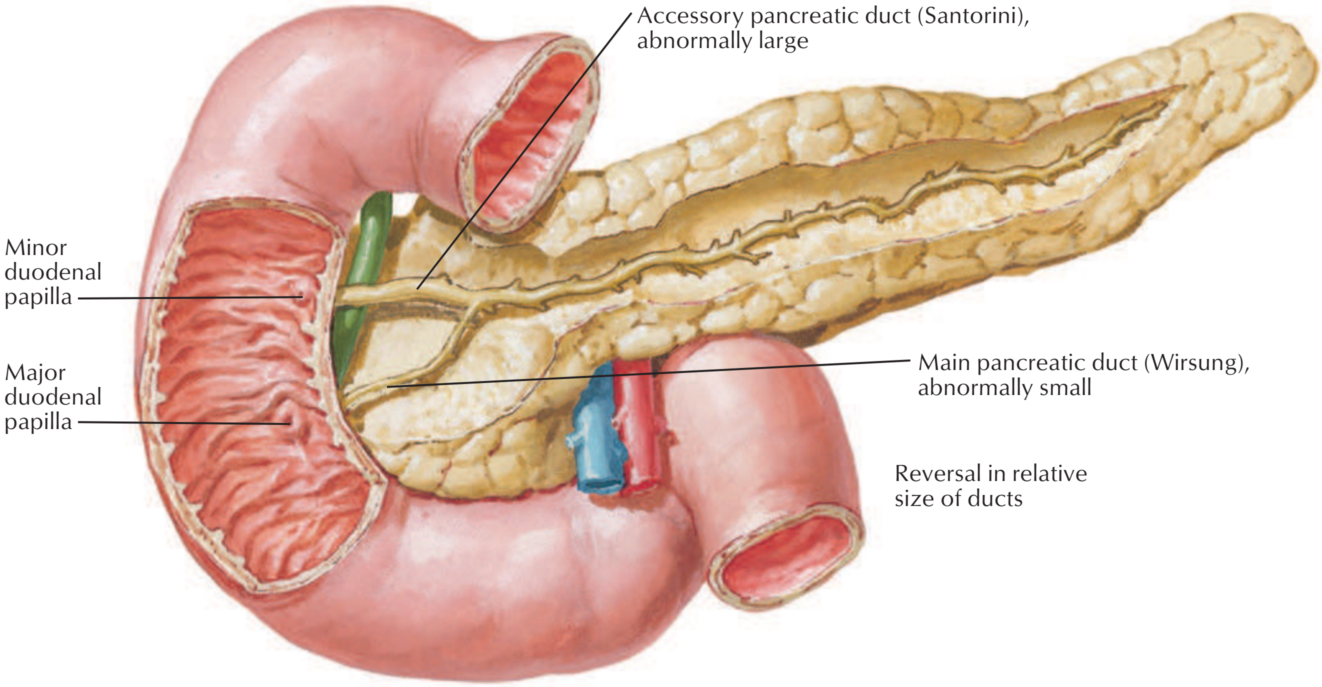

Colic branch
Ileocolic a.
Ileal branch
Post. cecal a.
Append. arteries
Ant. cecal a.
Append. arteries

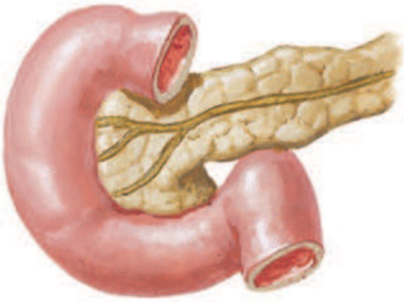
Anterior cecal and posterior cecal arteries originate from arcade; two appendicular arteries, one deriving from anterior cecal, the other from posterior cecal, are present

Some variations in posterior peritoneal attachment of cecum

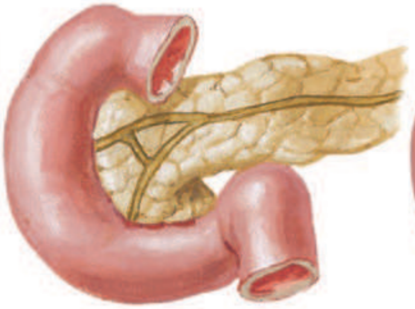

Attached area
Lines of posterior peritoneal reflection
Attached area
Lines of posterior peritoneal reflection
Attached area
Lines of posterior peritoneal reflection
Attached area
Lines of posterior peritoneal reflection

Variations in Pancreatic Duct

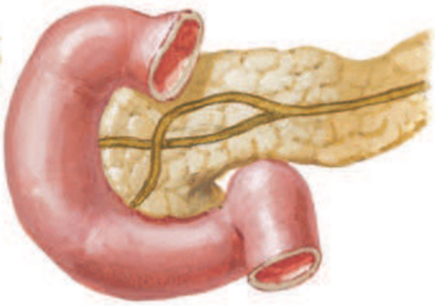

Accessory pancreatic duct (Santorini), abnormally large
Minor duodenal papilla
Major duodenal papilla
Main pancreatic duct (Wirsung), abnormally small
Reversal in relative size of ducts



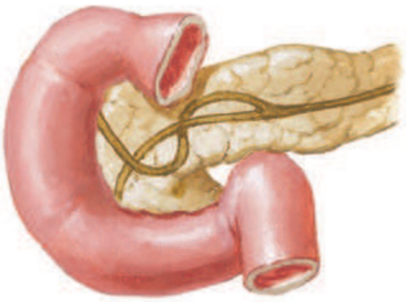
Double accessory pancreatic duct (Santorini)



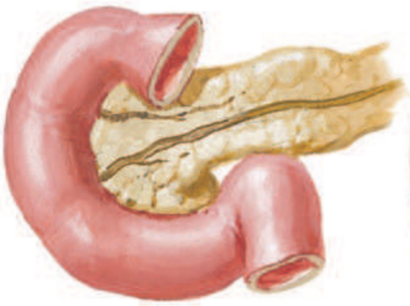
Anastomosis between ducts



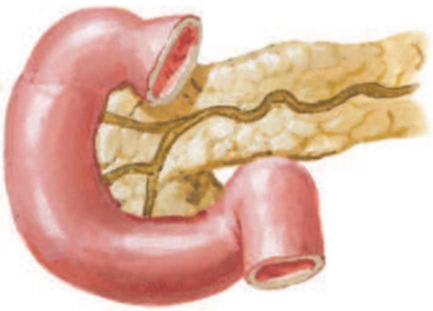
Crossing of ducts



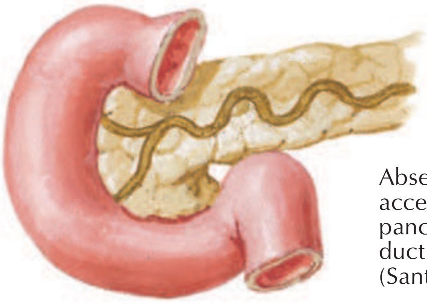
Double crossing of ducts



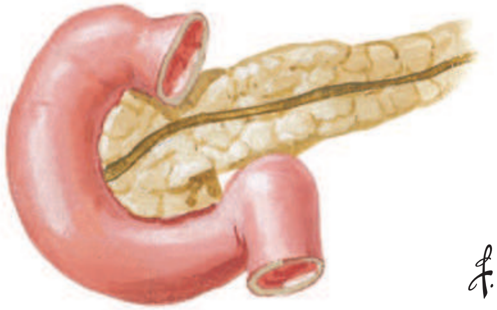
No communication between ducts



Double main pancreatic duct (Wirsung)

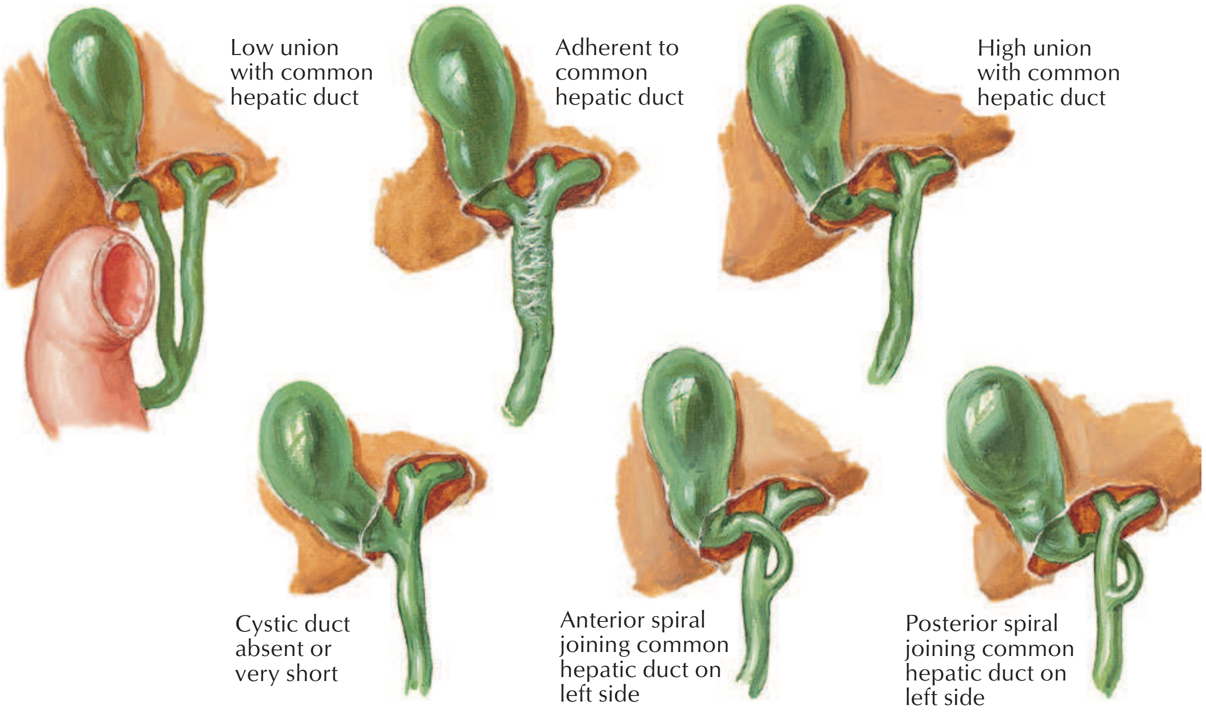


Tortuosity of ducts

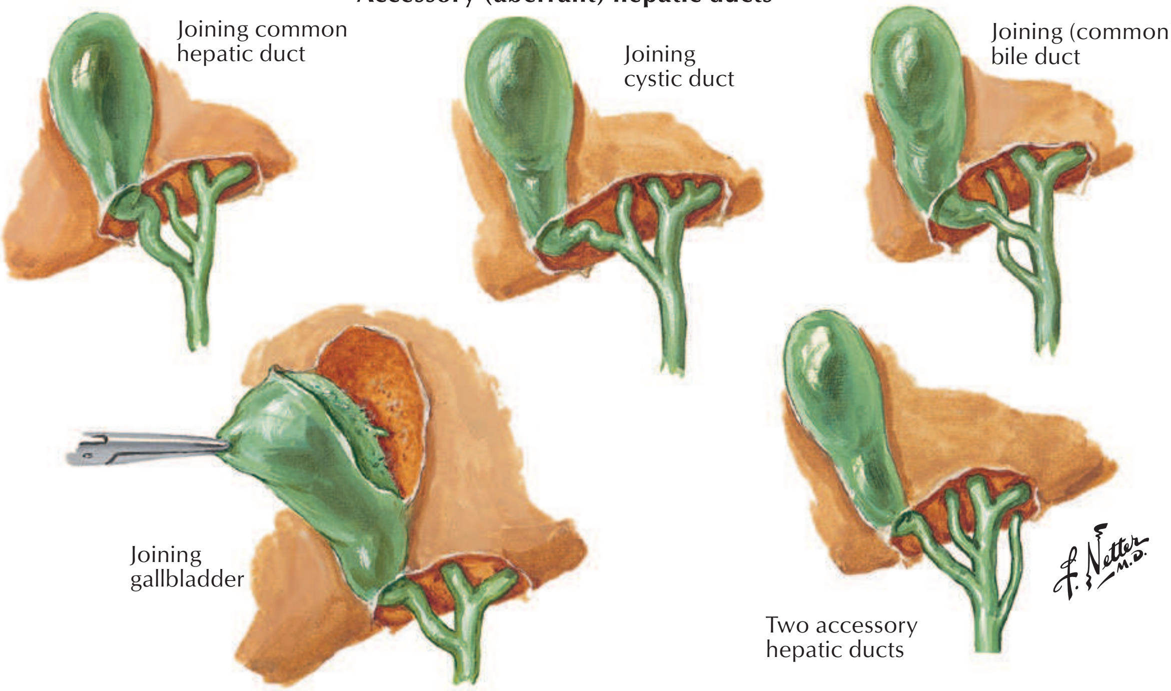


Absence of accessory pancreatic duct (Santorini)

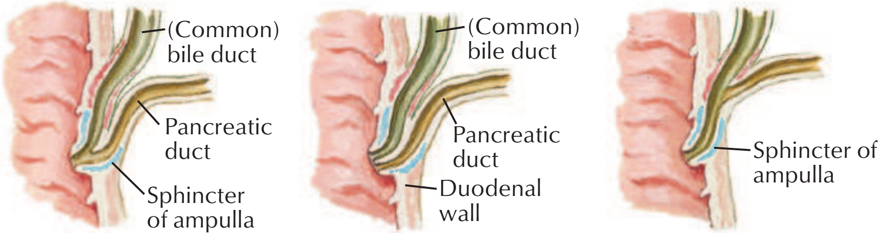
Variations in cystic duct


Low union with common hepatic duct
Adherent to common hepatic duct
High union with common hepatic duct
Cystic duct absent or very short
Anterior spiral joining common hepatic duct on left side
Posterior spiral joining common hepatic duct on left side

Accessory (aberrant) hepatic ducts

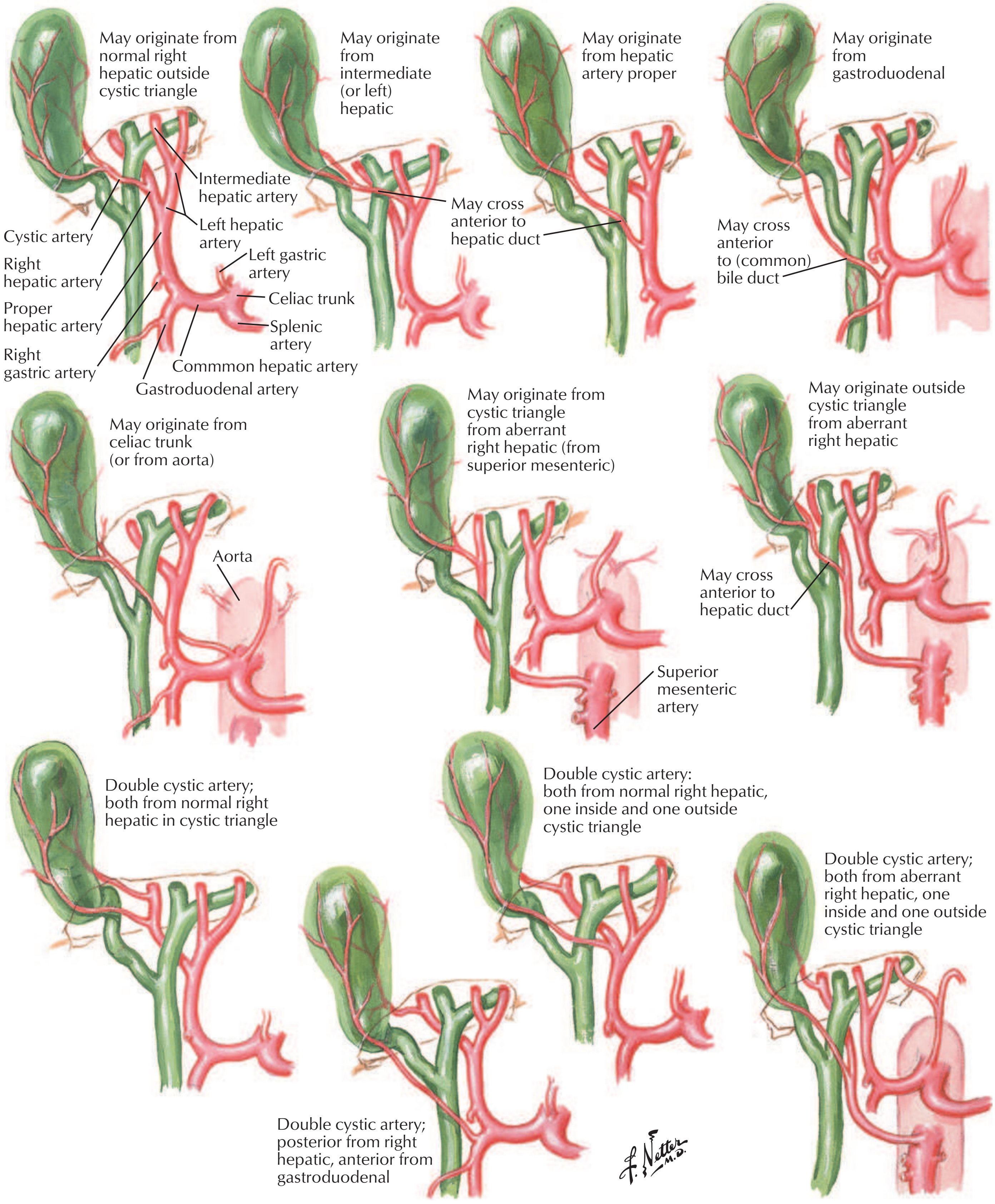

Joining common hepatic duct
Joining cystic duct
Joining (common) bile duct
Joining gallbladder
Two accessory hepatic ducts

Variations in union of bile and pancreatic ducts


(Common) bile duct
Pancreatic duct
Sphincter of ampulla
(Common) bile duct
Pancreatic duct
Duodenal wall
Sphincter of ampulla

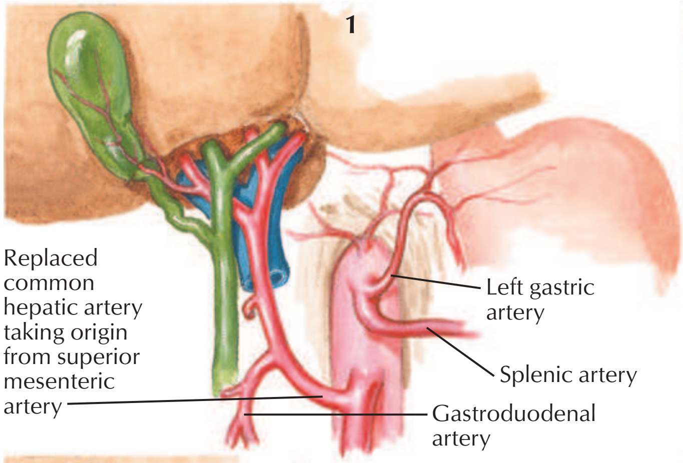
Short common channel
No common channel
Long common channel

Variations in Cystic Arteries

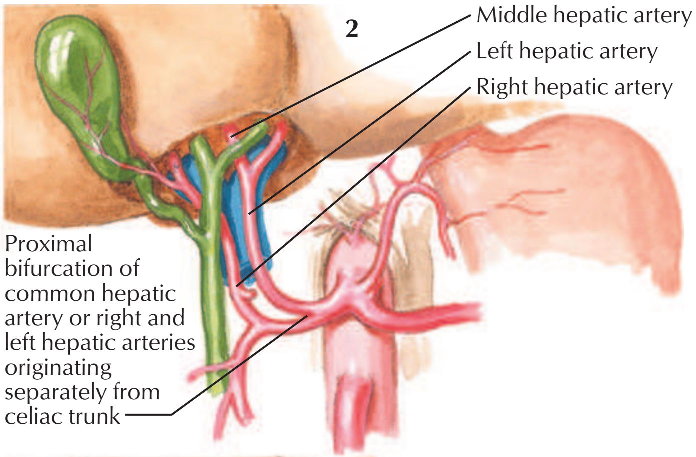

May originate from normal right hepatic outside cystic triangle
Intermediate hepatic artery
Left hepatic artery
Left gastric artery
Celiac trunk
Splenic artery
Commmon hepatic artery
Gastroduodenal artery
Cystic artery
Right hepatic artery
Proper hepatic artery
Right gastric artery
May originate from intermediate (or left) hepatic
May cross anterior to hepatic duct
May originate from hepatic artery proper
May originate from gastroduodenal
May cross anterior to (common) bile duct
May originate from celiac trunk (or from aorta)
Aorta
May originate from cystic triangle from aberrant right hepatic (from superior mesenteric)
Superior mesenteric artery
May originate outside cystic triangle from aberrant right hepatic
May cross anterior to hepatic duct
Double cystic artery; both from normal right hepatic in cystic triangle
Double cystic artery: both from normal right hepatic, one inside and one outside cystic triangle
Double cystic artery; both from aberrant right hepatic, one inside and one outside cystic triangle
Double cystic artery; posterior from right hepatic, anterior from gastroduodenal

Variations in Hepatic Arteries

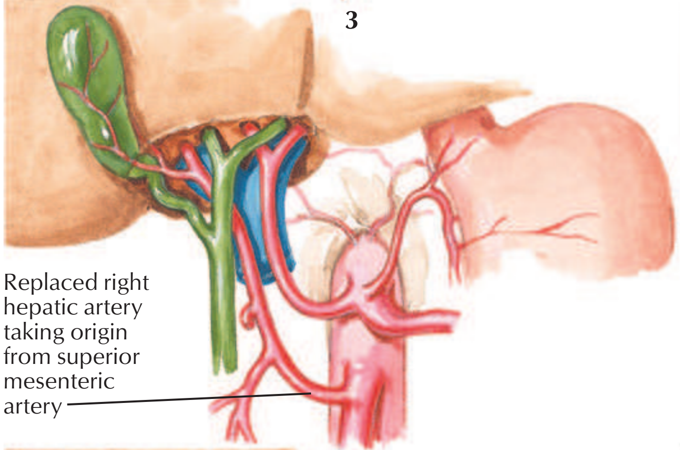
1


Replaced common hepatic artery taking origin from superior mesenteric artery
Left gastric artery
Splenic artery
Gastroduodenal artery

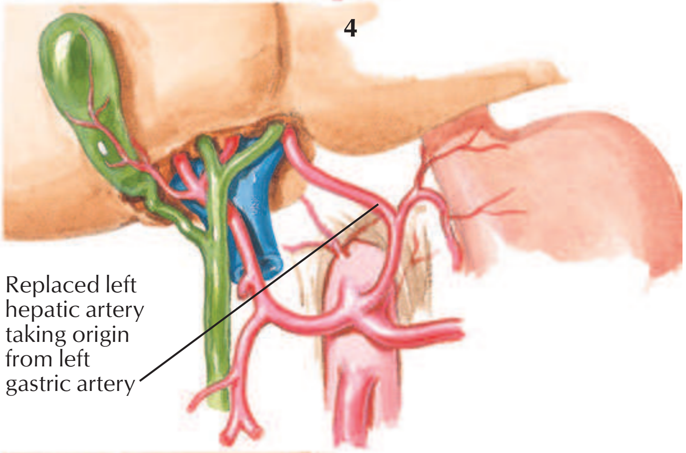
2


Middle hepatic artery
Left hepatic artery
Right hepatic artery
Proximal bifurcation of common hepatic artery or right and left hepatic arteries originating separately from celiac trunk

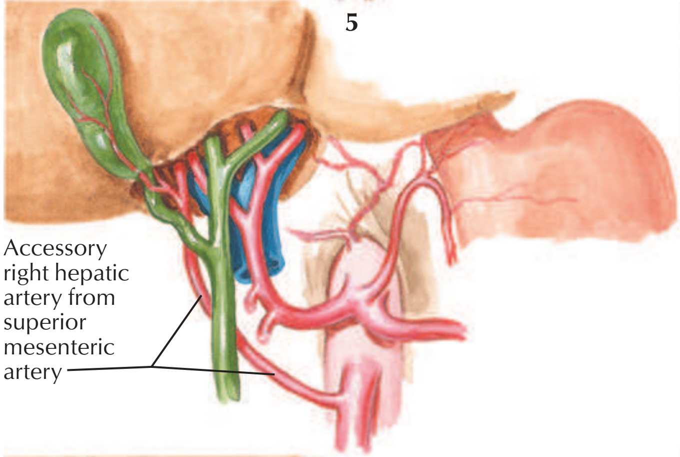
3


Replaced right hepatic artery taking origin from superior mesenteric artery

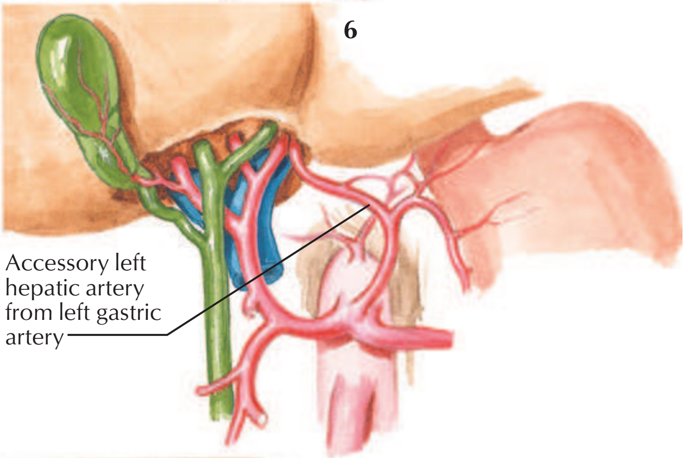
4


Replaced left hepatic artery taking origin from left gastric artery

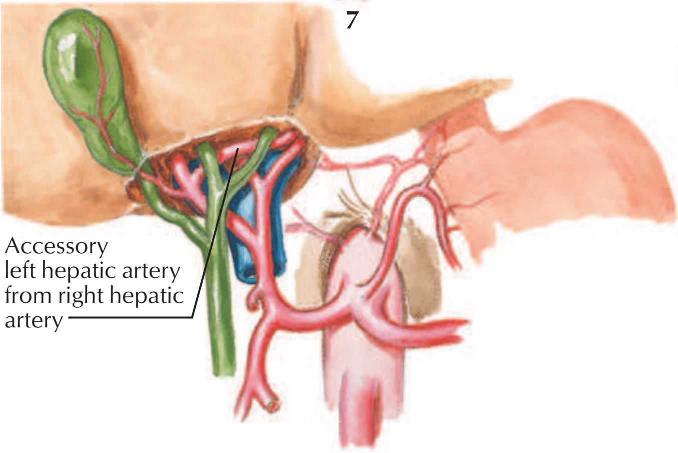
5


Accessory right hepatic artery from superior mesenteric artery

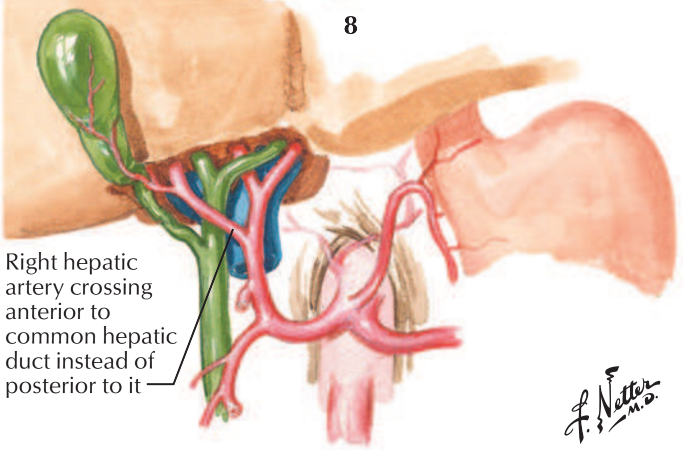
6


Accessory left hepatic artery from left gastric artery

7


Accessory left hepatic artery from right hepatic artery

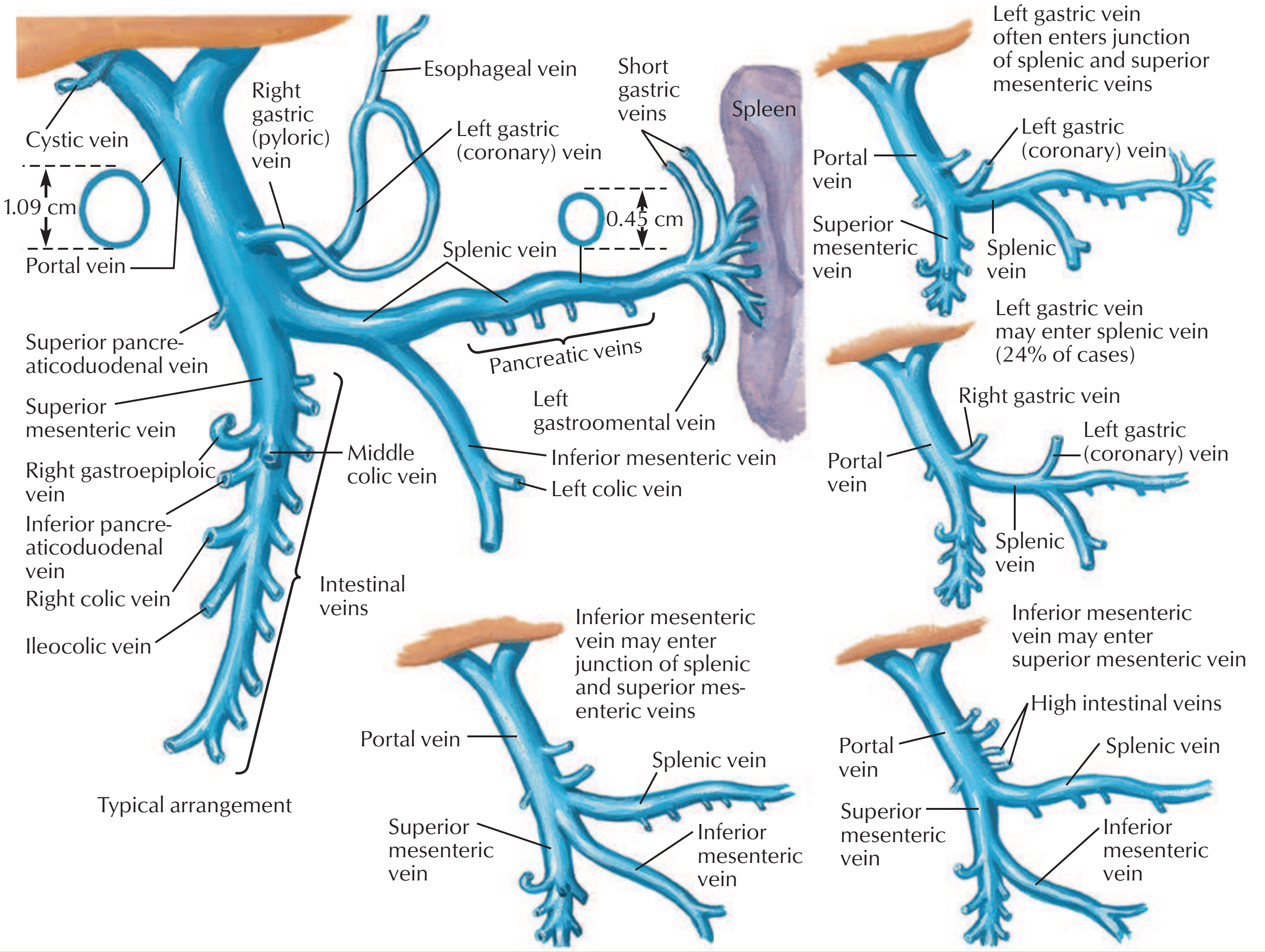
8


Right hepatic artery crossing anterior to common hepatic duct instead of posterior to it

F. Netter M.D.

Variations and Anomalies of Hepatic Portal Vein

Variations


Cystic vein
1.09 cm
Portal vein
Right gastric (pyloric) vein
Esophageal vein
Left gastric (coronary) vein
Short gastric veins
Spleen
0.45 cm
Splenic vein
Superior pancreaticoduodenal vein
Pancreatic veins
Superior mesenteric vein
Left gastroomental vein
Right gastroepiploic vein
Middle colic vein
Inferior mesenteric vein
Left colic vein
Inferior pancreaticoduodenal vein
Right colic vein
Intestinal veins
Ileocolic vein
Portal vein
Left gastric (coronary) vein
Superior mesenteric vein
Splenic vein
Right gastric vein
Portal vein
Left gastric (coronary) vein
Splenic vein
Portal vein
Splenic vein
Superior mesenteric vein
Inferior mesenteric vein
High intestinal veins
Portal vein
Splenic vein
Superior mesenteric vein
Inferior mesenteric vein

Typical arrangement

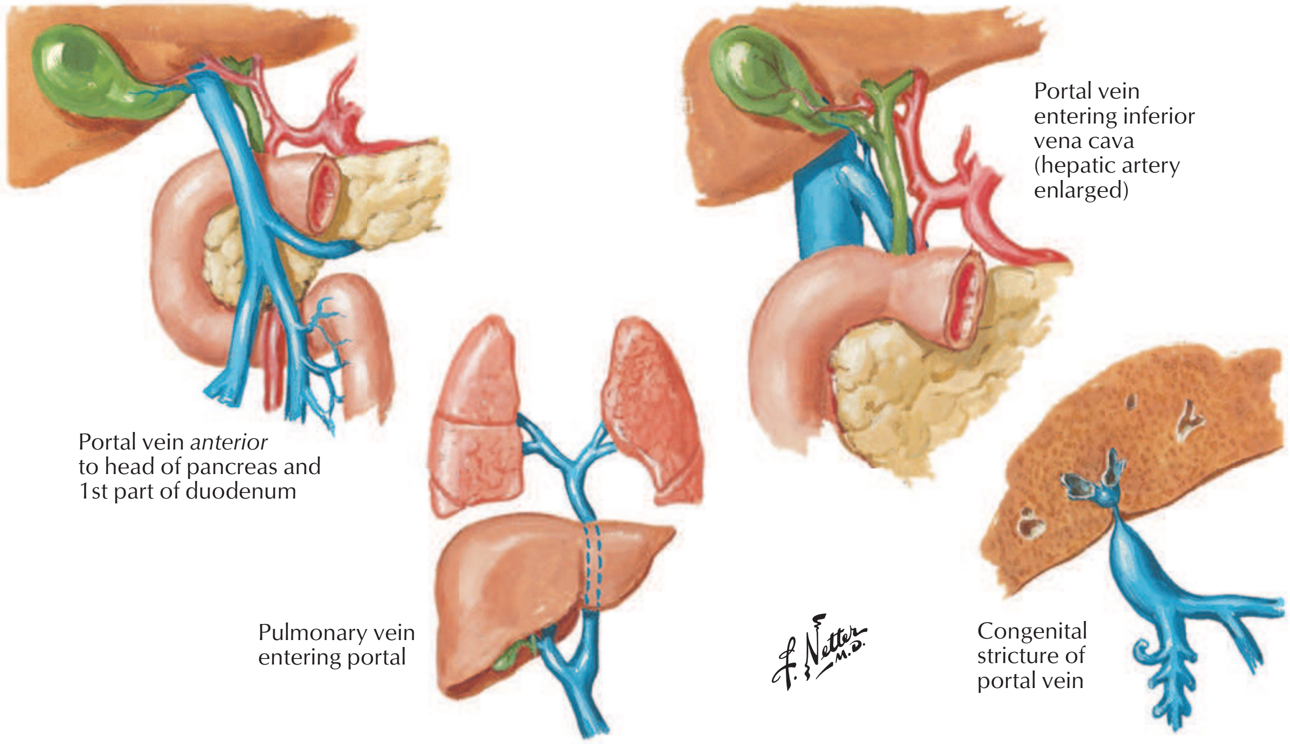
Left gastric vein often enters junction of splenic and superior mesenteric veins

Left gastric vein may enter splenic vein (24% of cases)

Inferior mesenteric vein may enter junction of splenic and superior mesenteric veins

Inferior mesenteric vein may enter superior mesenteric vein

Anomalies



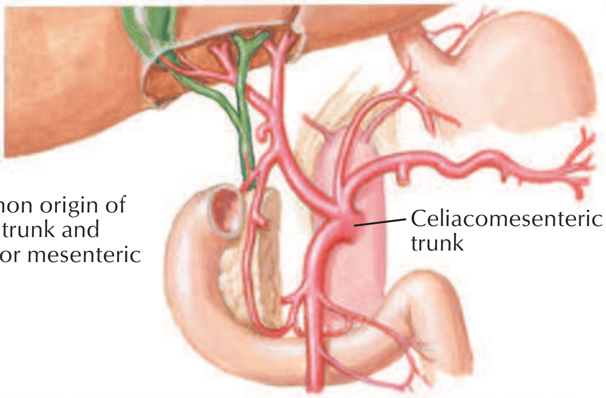
Portal vein *anterior* to head of pancreas and 1st part of duodenum

Pulmonary vein entering portal

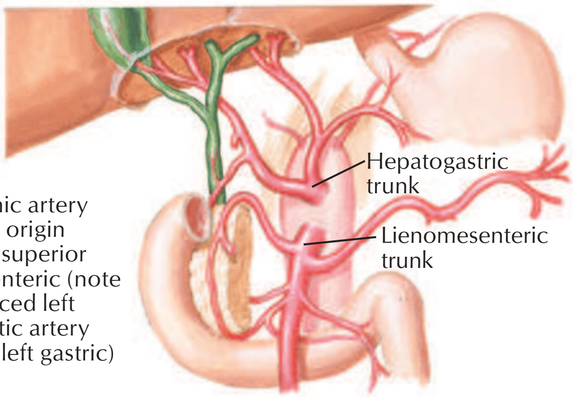
Portal vein entering inferior vena cava (hepatic artery enlarged)

Congenital stricture of portal vein

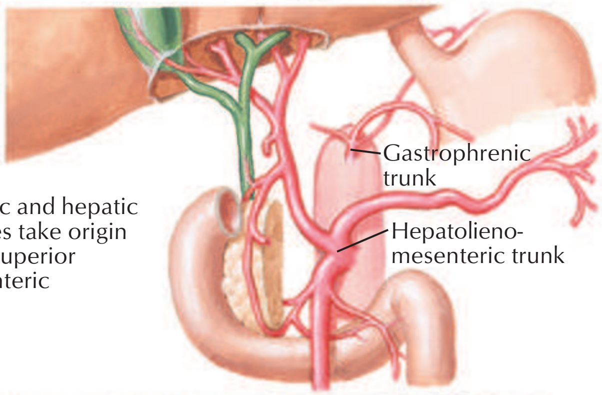
Variations in Celiac Trunk


Celiacomesenteric trunk

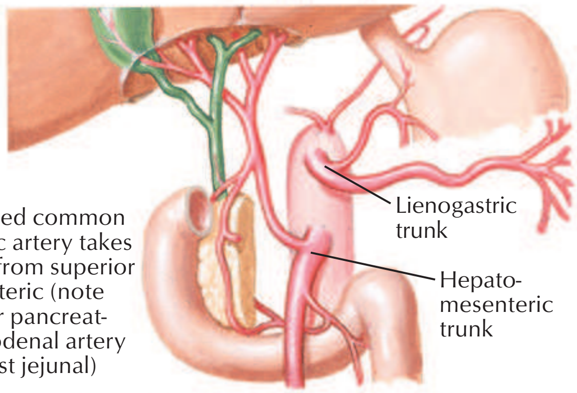
Common origin of celiac trunk and superior mesenteric artery


Hepatogastric trunk
Lienomesenteric trunk

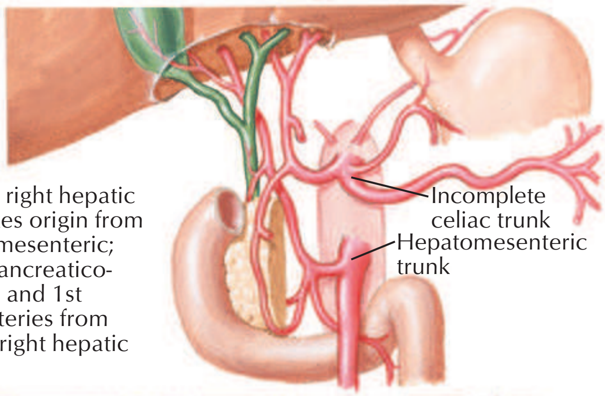
Splenic artery takes origin from superior mesenteric (note replaced left hepatic artery from left gastric)


Gastrophrenic trunk
Hepatolieno-mesenteric trunk

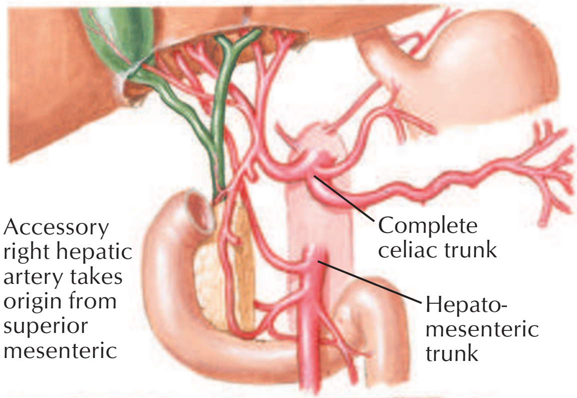
Splenic and hepatic arteries take origin from superior mesenteric


Lienogastric trunk
Hepato-mesenteric trunk

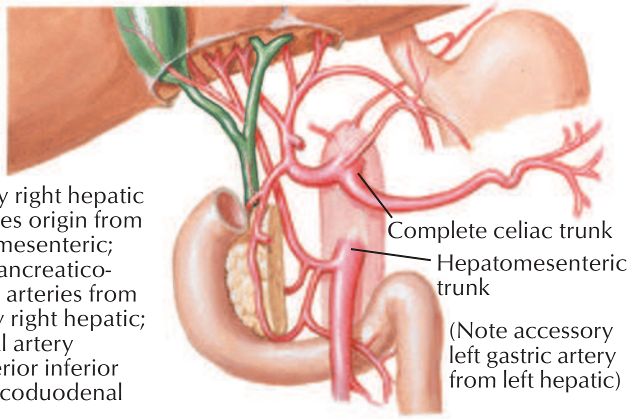
Replaced common hepatic artery takes origin from superior mesenteric (note inferior pancreaticoduodenal artery from 1st jejunal)


Incomplete celiac trunk
Hepatomesenteric trunk

Replaced right hepatic artery takes origin from superior mesenteric; inferior pancreaticoduodenal and 1st jejunal arteries from replaced right hepatic

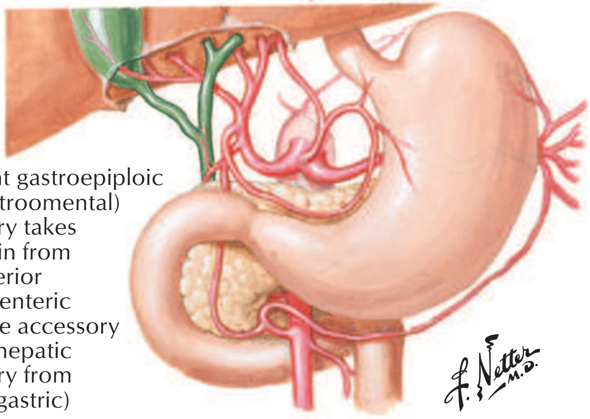

Complete celiac trunk
Hepato-mesenteric trunk

Accessory right hepatic artery takes origin from superior mesenteric


Complete celiac trunk
Hepatomesenteric trunk

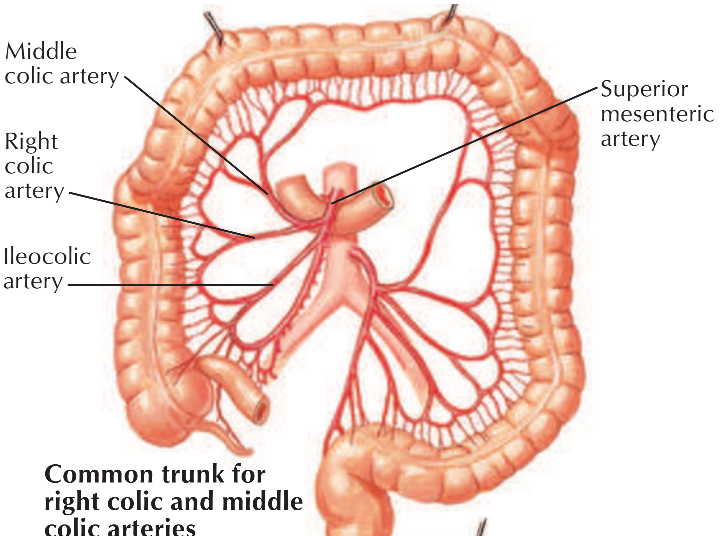
Accessory right hepatic artery takes origin from superior mesenteric; inferior pancreaticoduodenal arteries from accessory right hepatic; 1st jejunal artery from anterior inferior pancreaticoduodenal

(Note accessory left gastric artery from left hepatic)

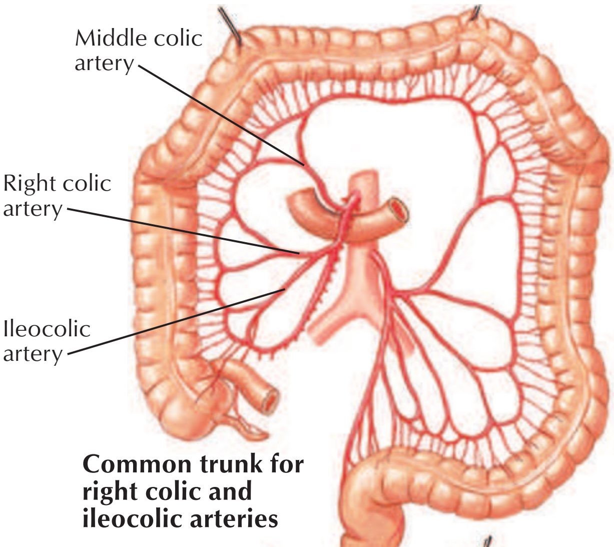


Right gastroepiploic (gastroomental) artery takes origin from superior mesenteric (note accessory left hepatic artery from left gastric)

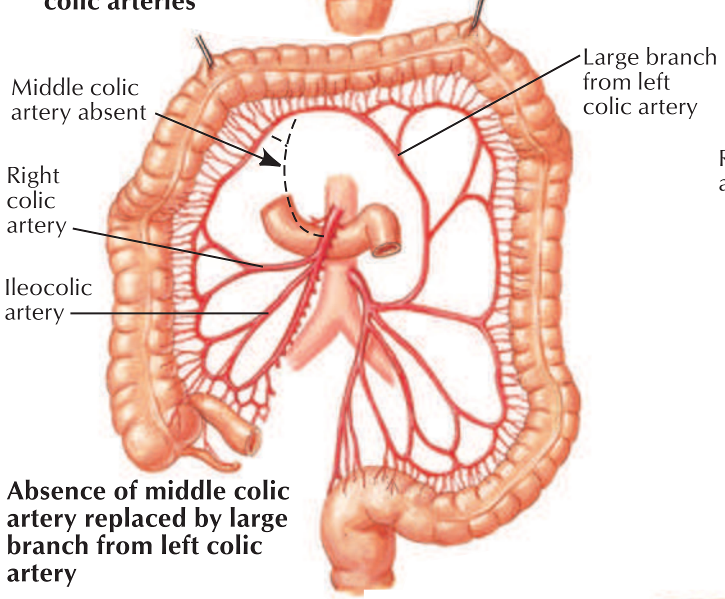
Variations in Colic Arteries


Middle colic artery
Right colic artery
Ileocolic artery
Superior mesenteric artery

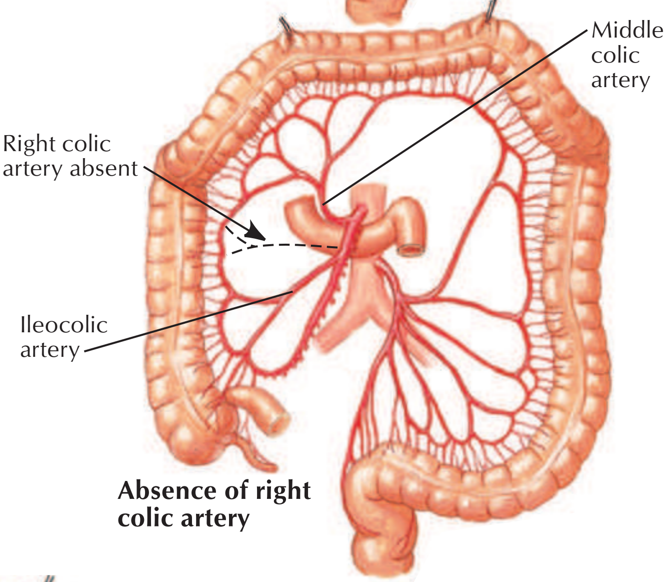
Common trunk for right colic and middle colic arteries


Middle colic artery
Right colic artery
Ileocolic artery

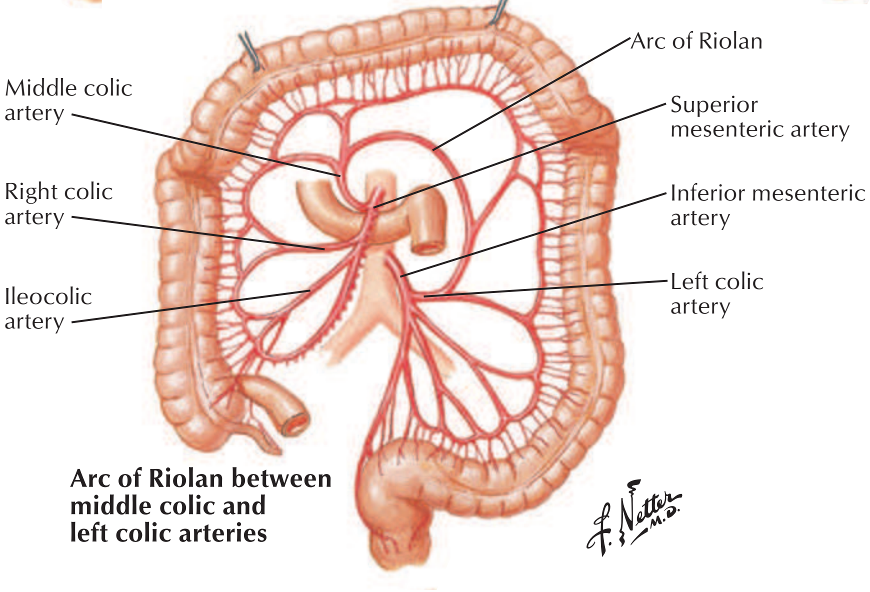
Common trunk for right colic and ileocolic arteries


Middle colic artery absent
Right colic artery
Ileocolic artery
Large branch from left colic artery

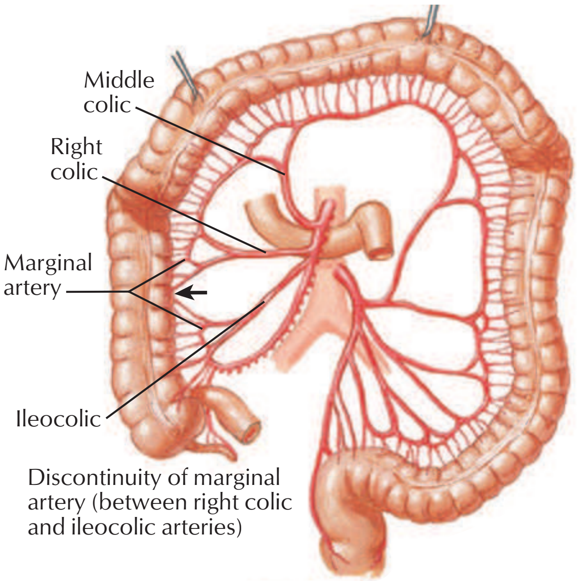
Absence of middle colic artery replaced by large branch from left colic artery


Right colic artery absent
Ileocolic artery
Middle colic artery

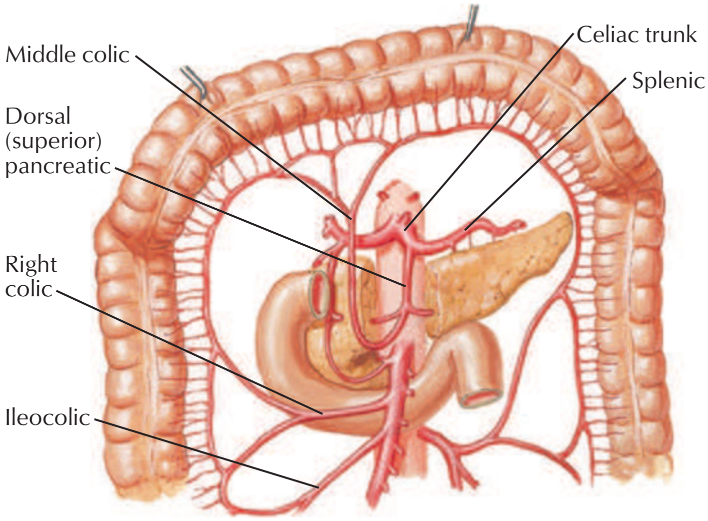
Absence of right colic artery


Middle colic artery
Right colic artery
Ileocolic artery
Arc of Riolan
Superior mesenteric artery
Inferior mesenteric artery
Left colic artery

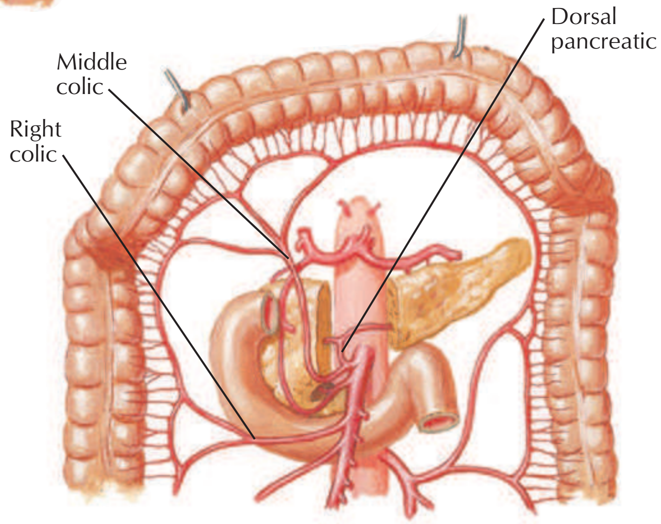
Arc of Riolan between middle colic and left colic arteries


Middle colic
Right colic
Marginal artery
Ileocolic

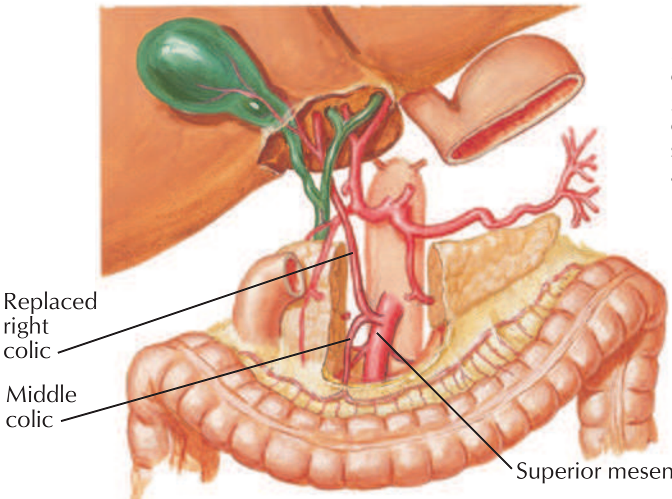
Discontinuity of marginal artery (between right colic and ileocolic arteries)


Middle colic
Dorsal (superior) pancreatic
Right colic
Ileocolic
Celiac trunk
Splenic

Middle colic artery originates from celiac trunk via dorsal pancreatic artery

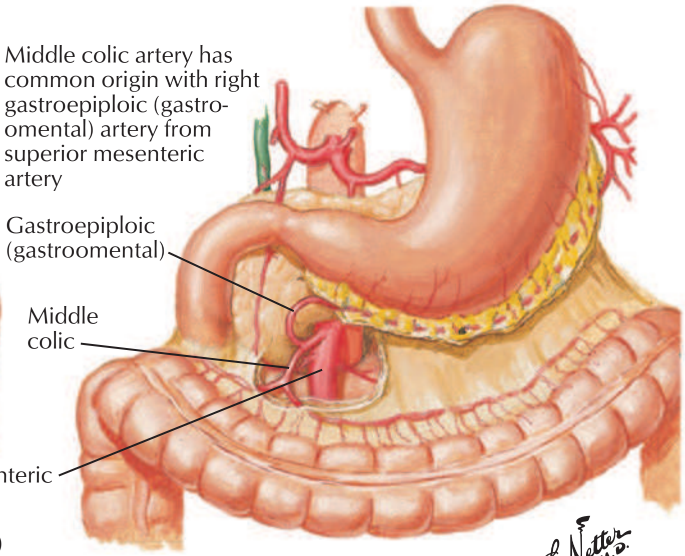

Middle colic
Right colic
Dorsal pancreatic

Middle colic artery gives origin to dorsal pancreatic artery


Replaced right colic
Middle colic
Superior mesenteric

Middle colic artery originates from replaced right hepatic artery (from superior mesenteric artery)

Middle colic artery has common origin with right gastroepiploic (gastro-omental) artery from superior mesenteric artery


Gastroepiploic (gastroomental)
Middle colic

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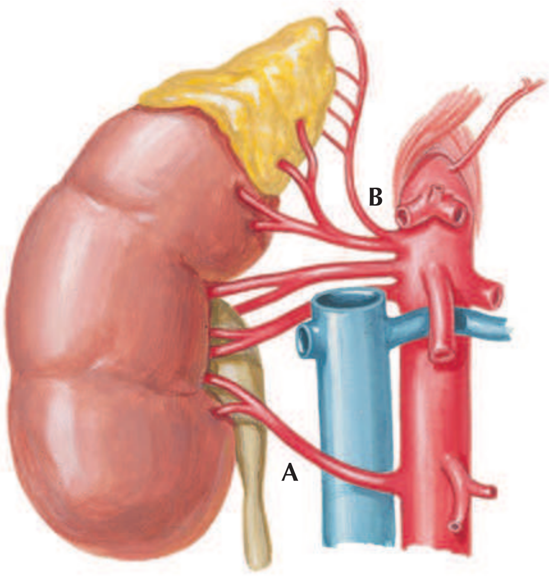
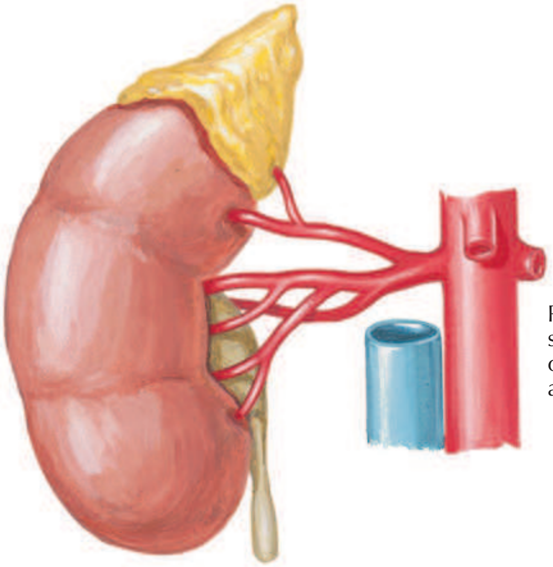
Variations in Renal Artery and Vein

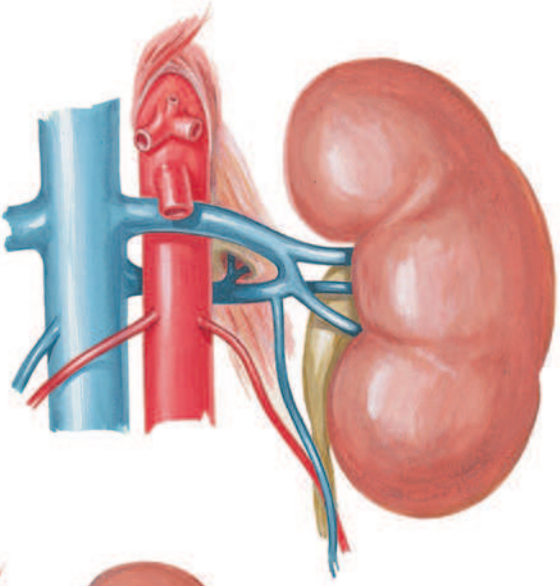


A Low accessory right renal artery may pass anterior to inferior vena cava instead of posterior to it

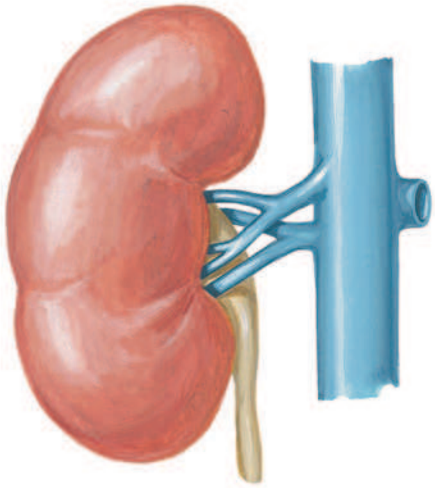
B Inferior phrenic artery with superior suprarenal arteries may arise from renal artery (middle suprarenal artery absent)



Proximal
subdivision
of renal
artery



Double left renal
vein may form
ring around
abdominal aorta



Multiple renal veins

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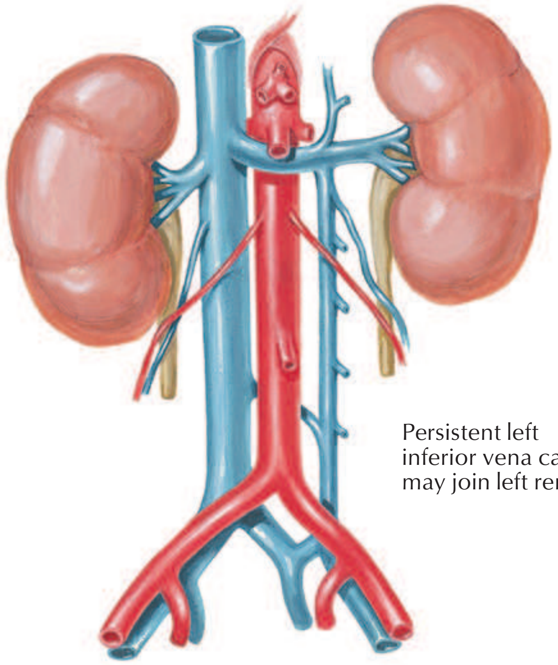
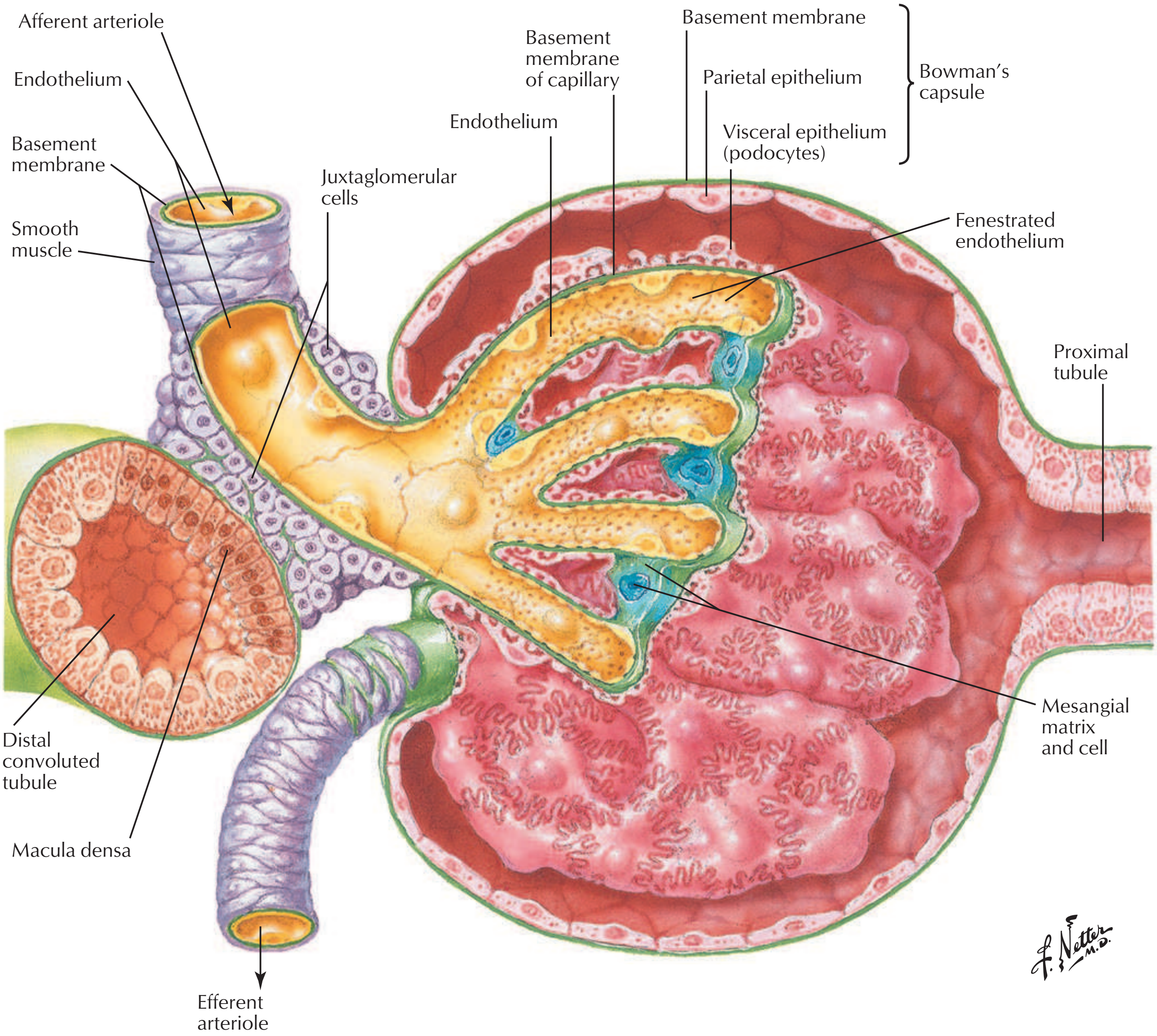
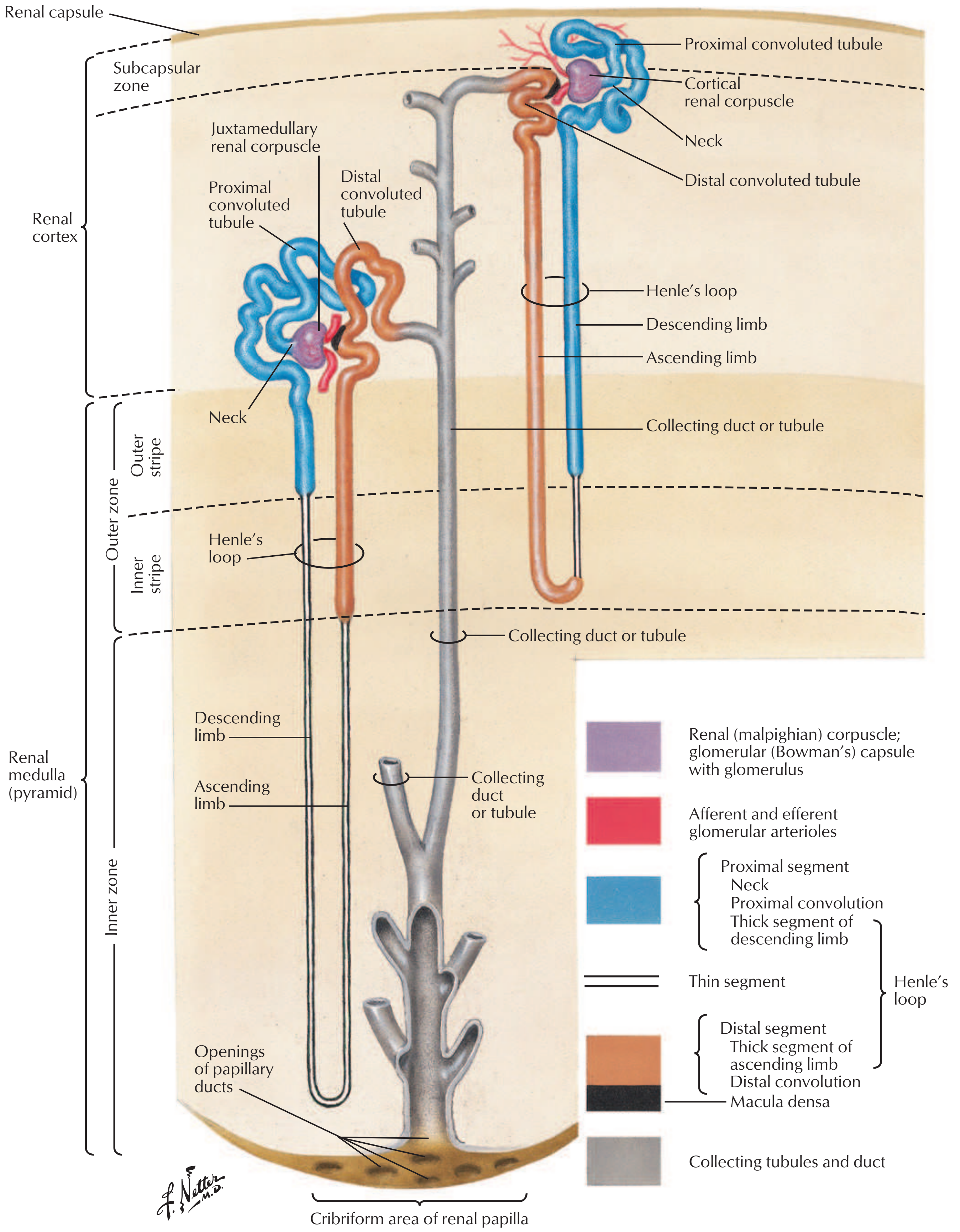
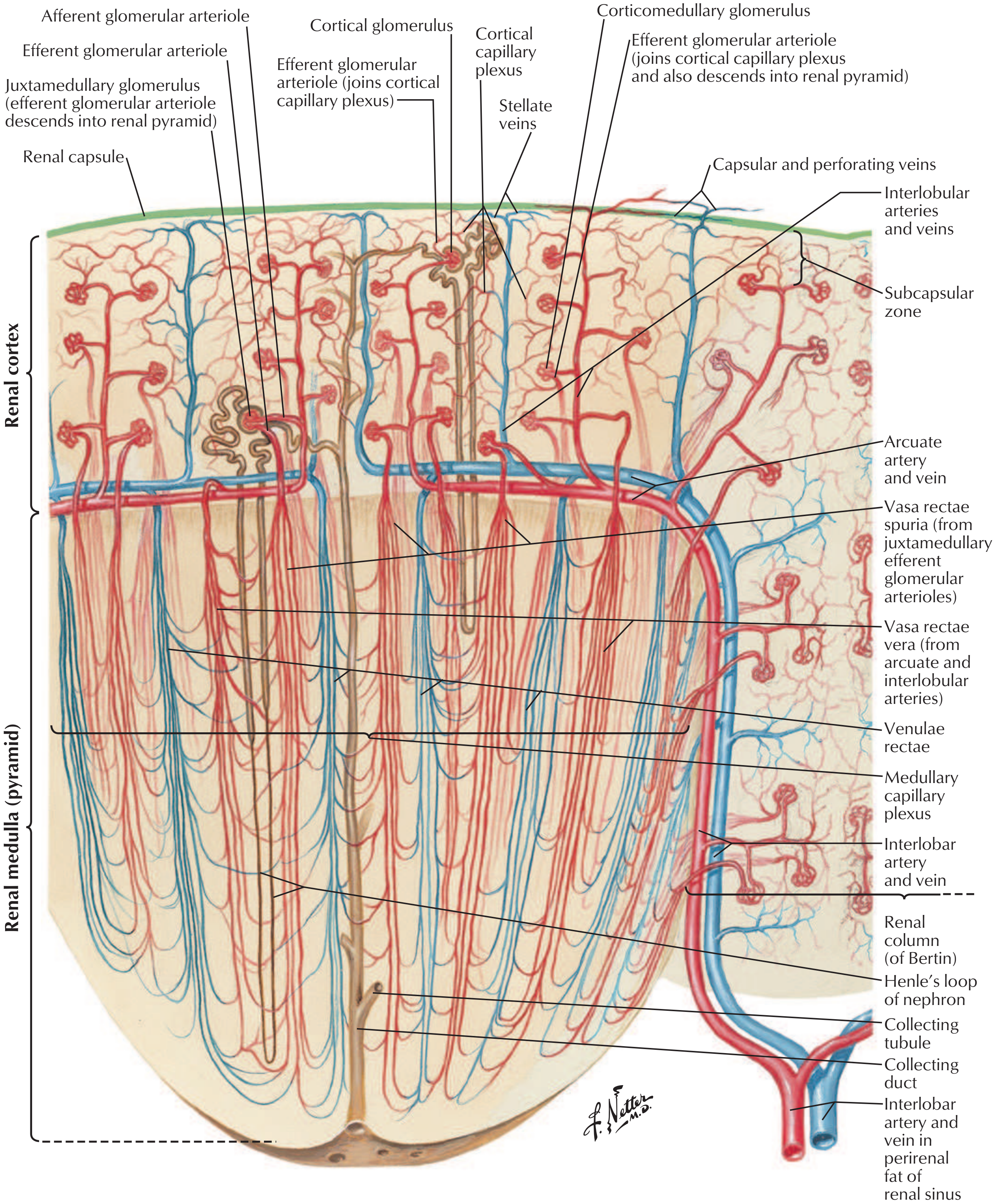


Persistent left
inferior vena cava
may join left renal vein

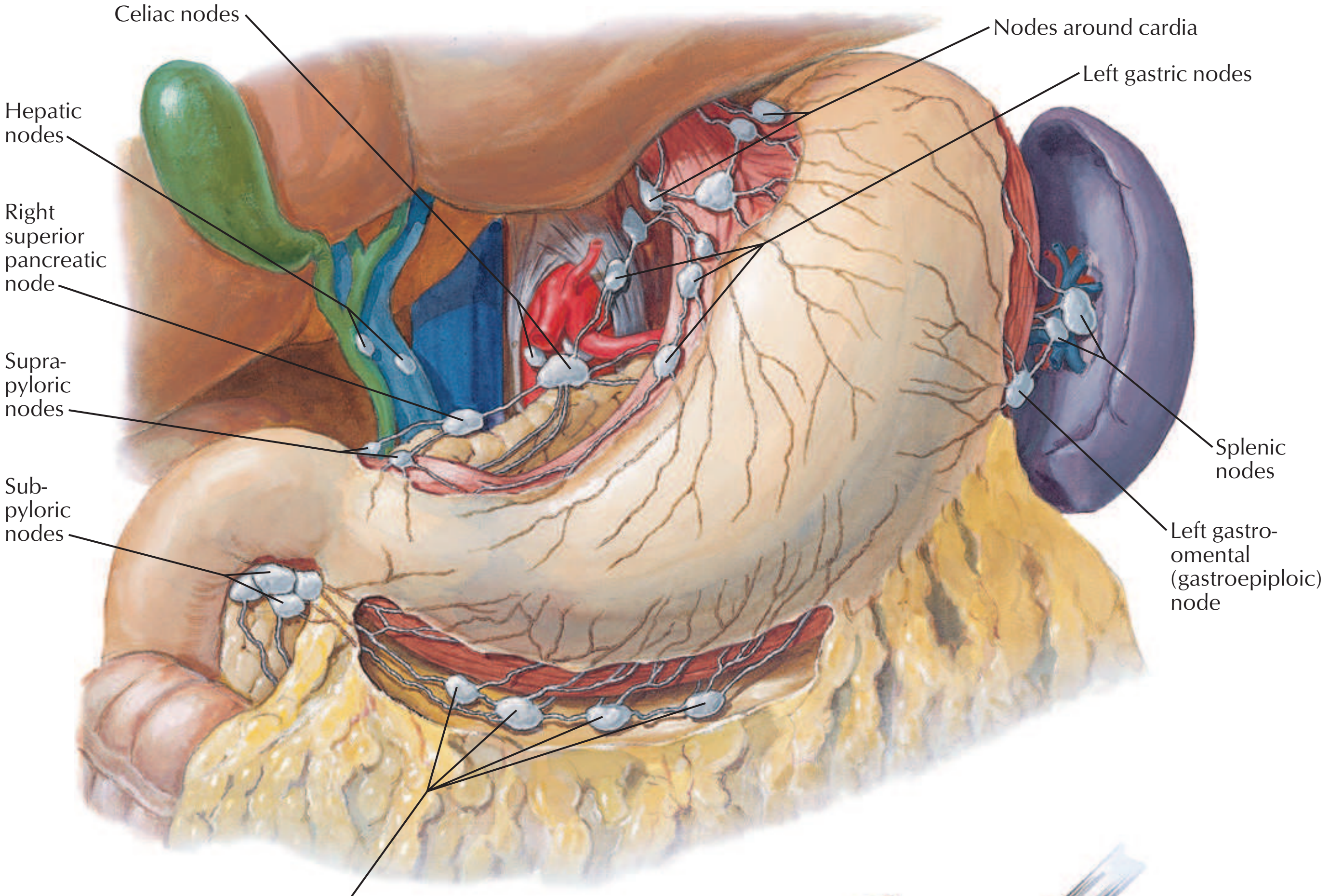

Afferent arteriole
Endothelium
Basement membrane
Smooth muscle
Juxtaglomerular cells
Endothelium
Basement membrane of capillary
Basement membrane
Parietal epithelium
Visceral epithelium (podocytes)
Bowman's capsule
Fenestrated endothelium
Proximal tubule
Mesangial matrix and cell
Distal convoluted tubule
Macula densa
Efferent arteriole
F. Netter M.D.

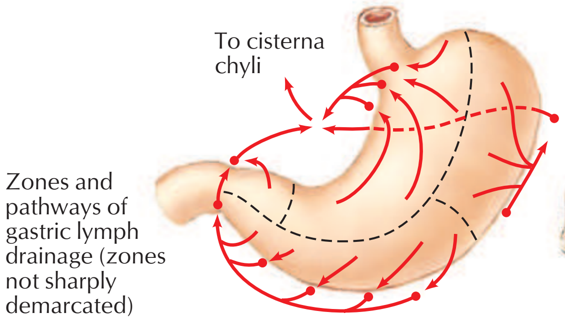
Nephron and Collecting Tubule: Schema


Renal capsule
Subcapsular zone
Renal cortex
Juxtamedullary renal corpuscle
Proximal convoluted tubule
Distal convoluted tubule
Neck
Outer zone
Outer stripe
Inner stripe
Henle's loop
Renal medulla (pyramid)
Inner zone
Descending limb
Ascending limb
Openings of papillary ducts
Cribriform area of renal papilla
Proximal convoluted tubule
Cortical renal corpuscle
Neck
Distal convoluted tubule
Henle's loop
Descending limb
Ascending limb
Collecting duct or tubule
Collecting duct or tubule
Collecting duct or tubule
Renal (malpighian) corpuscle; glomerular (Bowman's) capsule with glomerulus
Afferent and efferent glomerular arterioles
Proximal segment
Neck
Proximal convolution
Thick segment of descending limb
Thin segment
Henle's loop
Distal segment
Thick segment of ascending limb
Distal convolution
Macula densa
Collecting tubules and duct

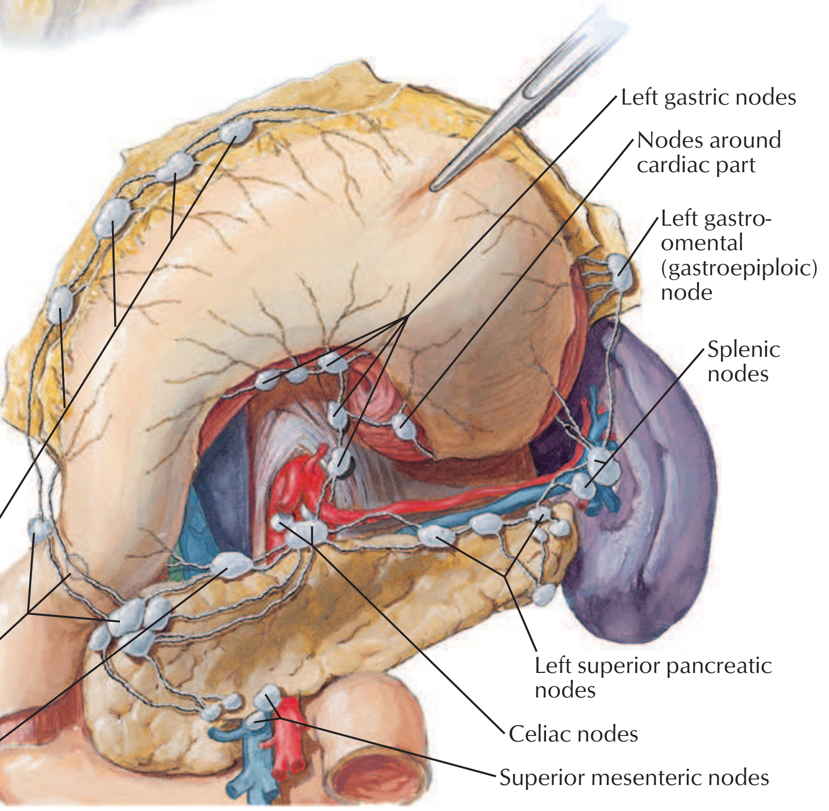

Afferent glomerular arteriole
Efferent glomerular arteriole
Juxtamedullary glomerulus (efferent glomerular arteriole descends into renal pyramid)
Renal capsule
Cortical glomerulus
Efferent glomerular arteriole (joins cortical capillary plexus)
Cortical capillary plexus
Stellate veins
Corticomedullary glomerulus
Efferent glomerular arteriole (joins cortical capillary plexus and also descends into renal pyramid)
Capsular and perforating veins
Interlobular arteries and veins
Subcapsular zone
Renal cortex
Arcuate artery and vein
Vasa rectae spuria (from juxtamedullary efferent glomerular arterioles)
Vasa rectae vera (from arcuate and interlobular arteries)
Venulae rectae
Medullary capillary plexus
Interlobar artery and vein
Renal medulla (pyramid)
Renal column (of Bertin)
Henle's loop of nephron
Collecting tubule
Collecting duct
Interlobar artery and vein in perirenal fat of renal sinus
F. Netter M.D.

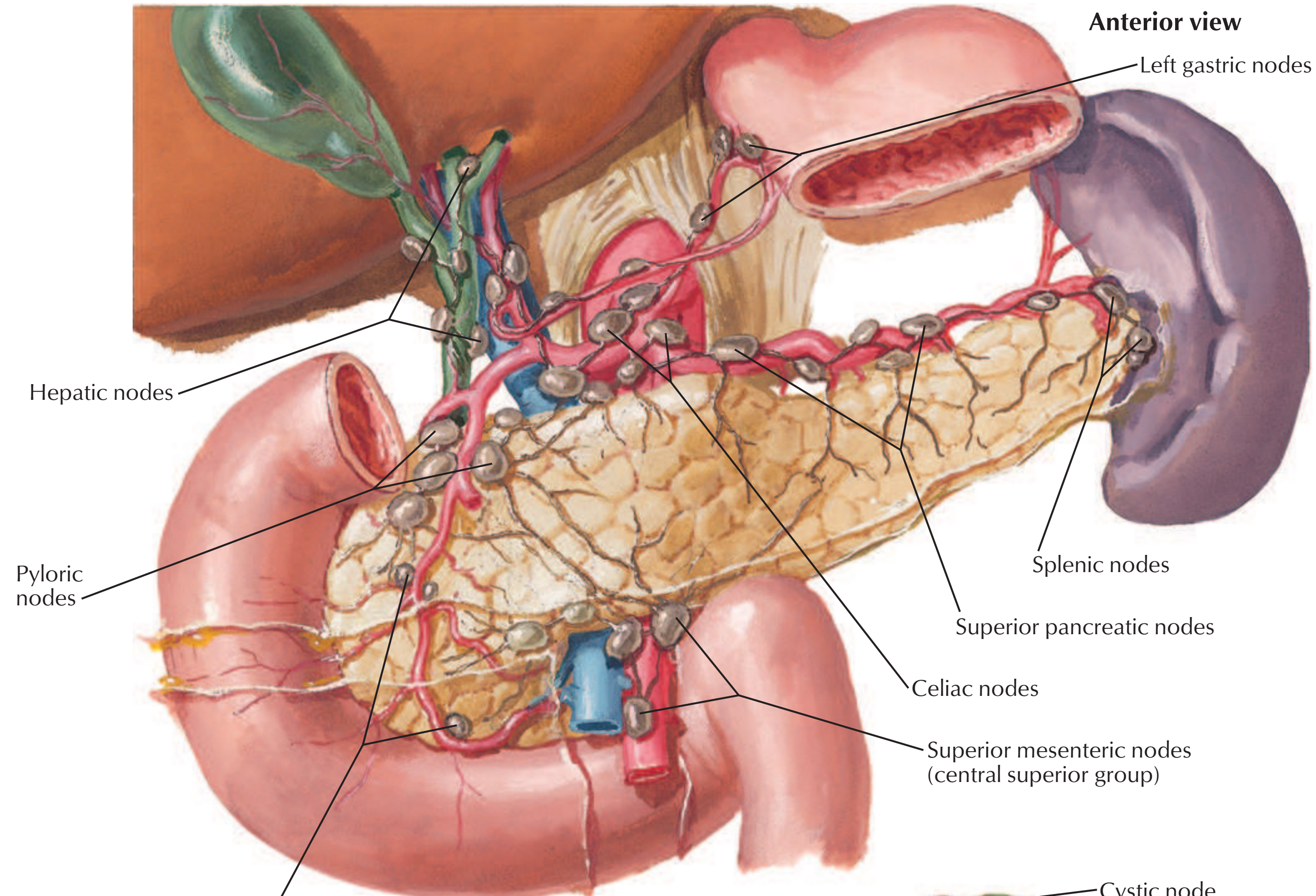
Lymph Vessels and Nodes of Stomach

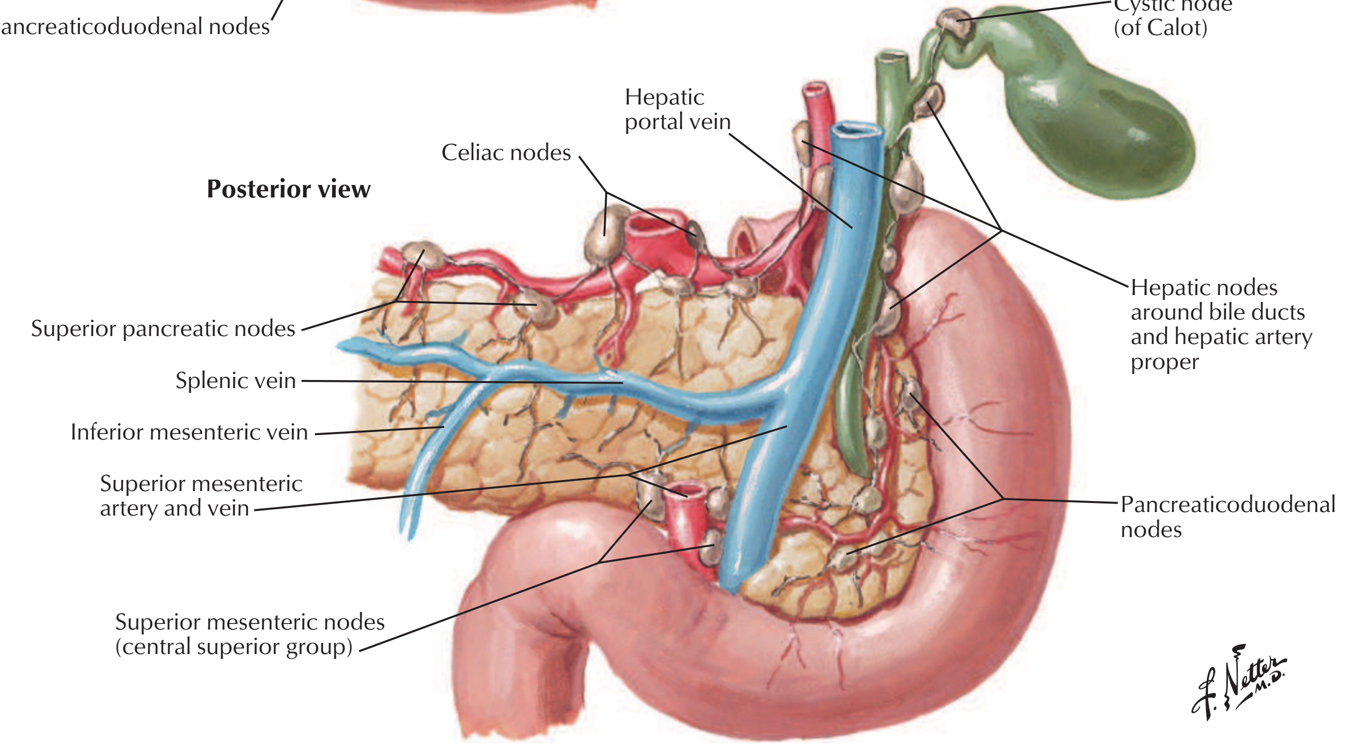

Celiac nodes
Nodes around cardia
Left gastric nodes
Hepatic nodes
Right superior pancreatic node
Supra-pyloric nodes
Sub-pyloric nodes
Splenic nodes
Left gastro-omental (gastroepiploic) node
Right gastroomental (gastroepiploic) nodes


To cisterna chyli

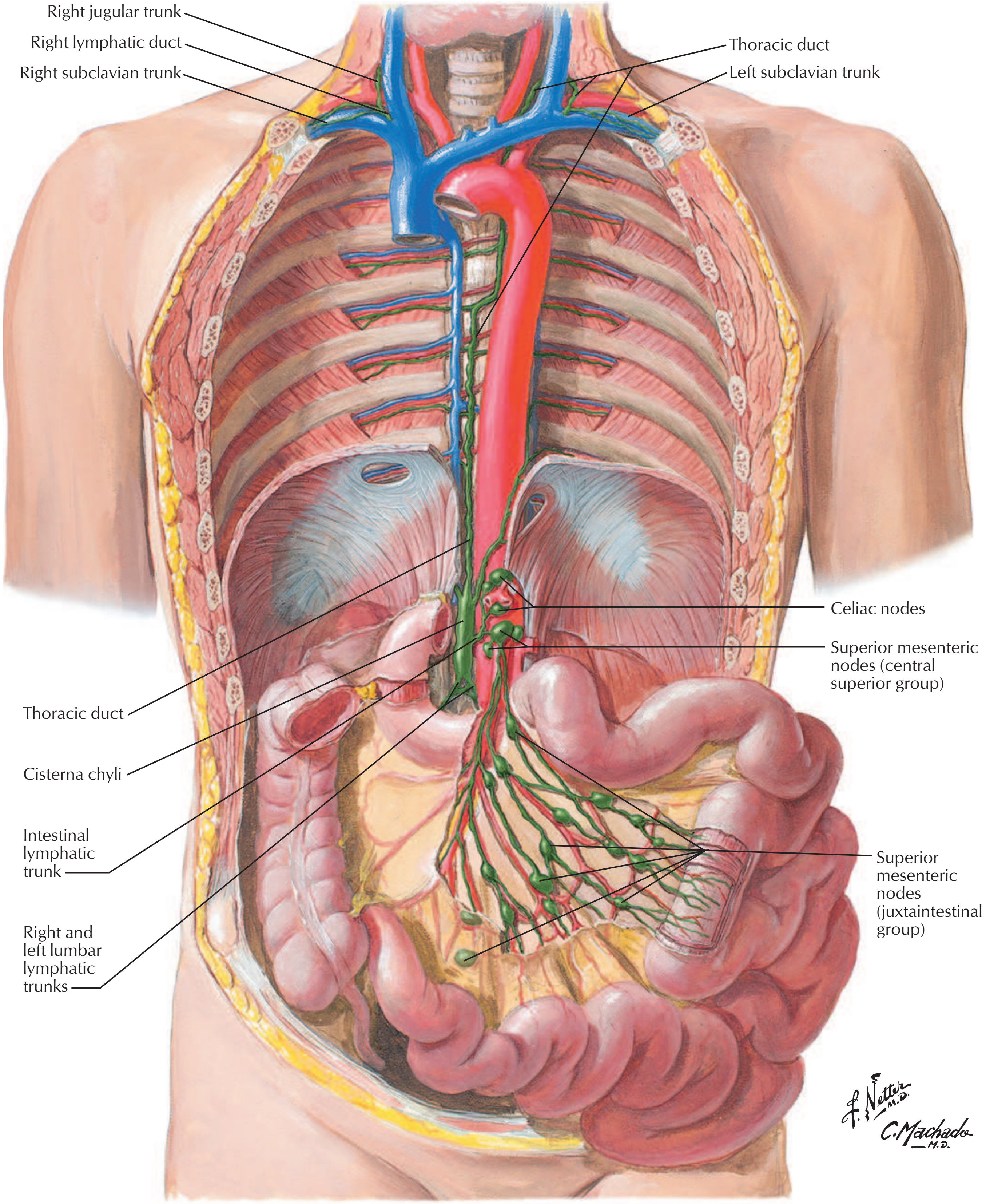
Zones and pathways of gastric lymph drainage (zones not sharply demarcated)

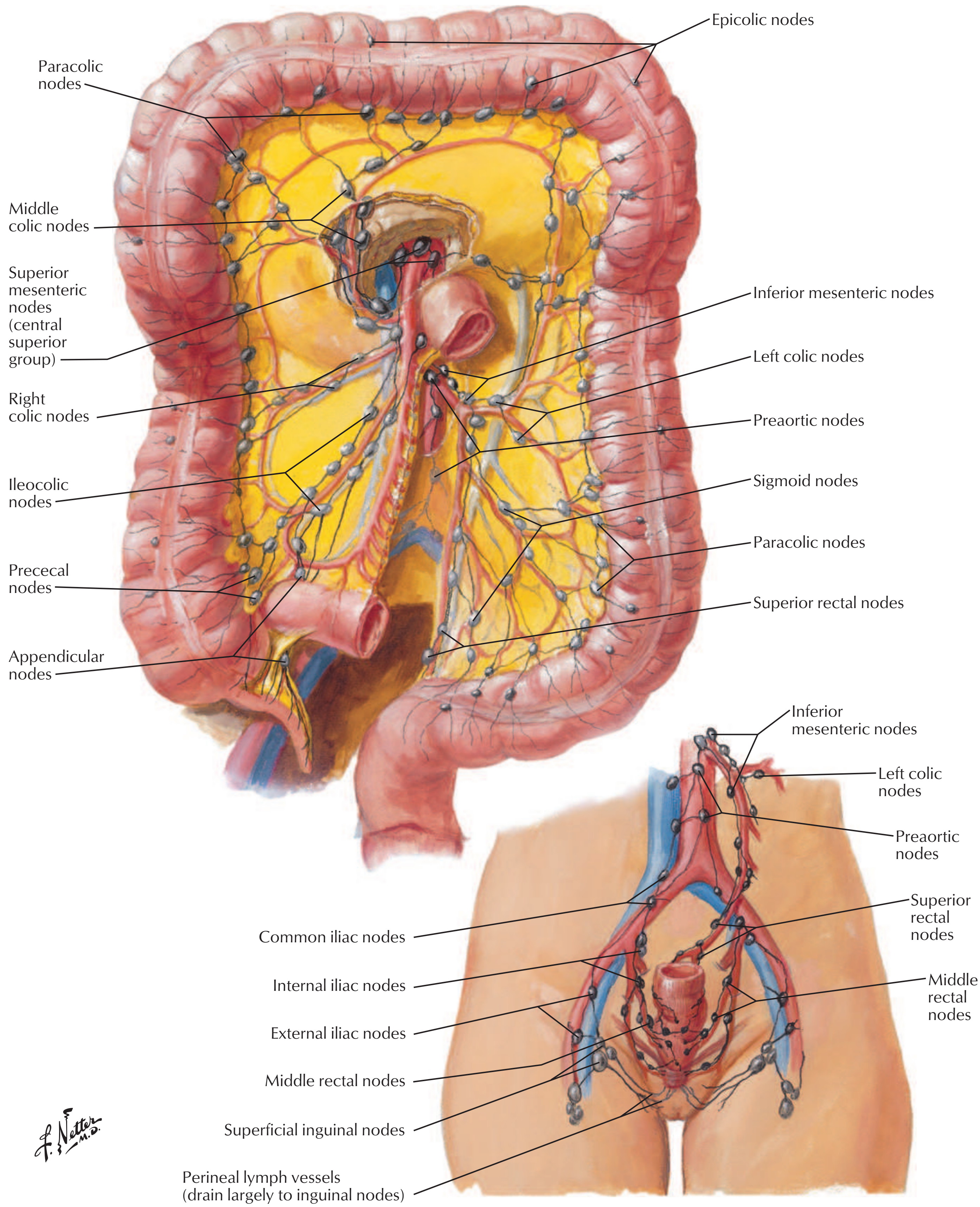

Left gastric nodes
Nodes around cardiac part
Left gastro-omental (gastroepiploic) node
Splenic nodes
Right gastroomental (gastroepiploic) nodes
Suprapyloric, retropyloric, and subpyloric nodes
Right superior pancreatic node
Left superior pancreatic nodes
Celiac nodes
Superior mesenteric nodes


Anterior view
Left gastric nodes
Hepatic nodes
Pyloric nodes
Splenic nodes
Superior pancreatic nodes
Celiac nodes
Superior mesenteric nodes (central superior group)
Pancreaticoduodenal nodes

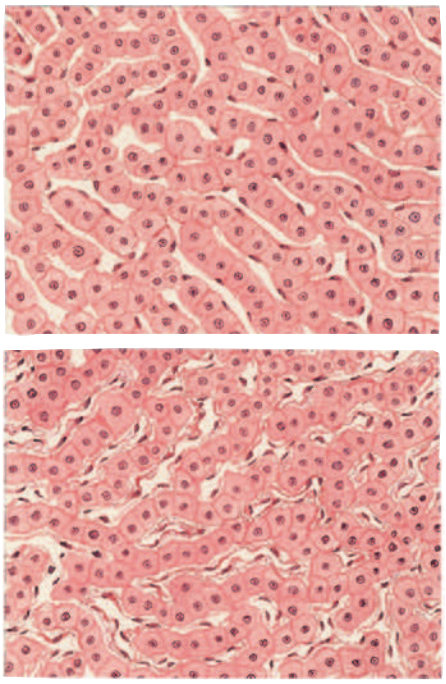

Cystic node (of Calot)
Hepatic portal vein
Celiac nodes
Posterior view
Superior pancreatic nodes
Splenic vein
Inferior mesenteric vein
Superior mesenteric artery and vein
Hepatic nodes around bile ducts and hepatic artery proper
Pancreaticoduodenal nodes
Superior mesenteric nodes (central superior group)

Lymph Vessels and Nodes of Small Intestine

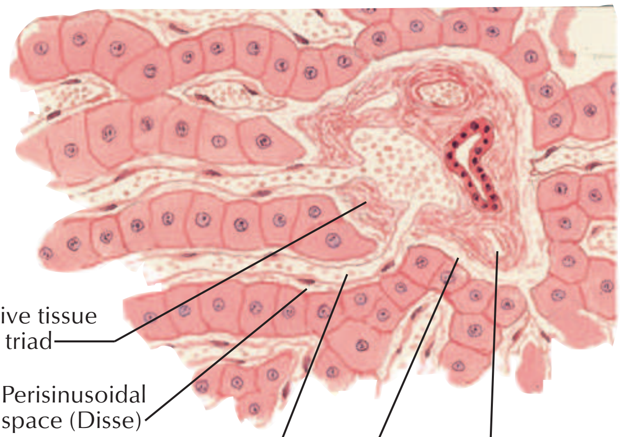

Right jugular trunk
Right lymphatic duct
Right subclavian trunk
Thoracic duct
Left subclavian trunk
Celiac nodes
Superior mesenteric nodes (central superior group)
Thoracic duct
Cisterna chyli
Intestinal lymphatic trunk
Right and left lumbar lymphatic trunks
Superior mesenteric nodes (juxtaintestinal group)
F. Netter M.D.
C. Machado M.D.

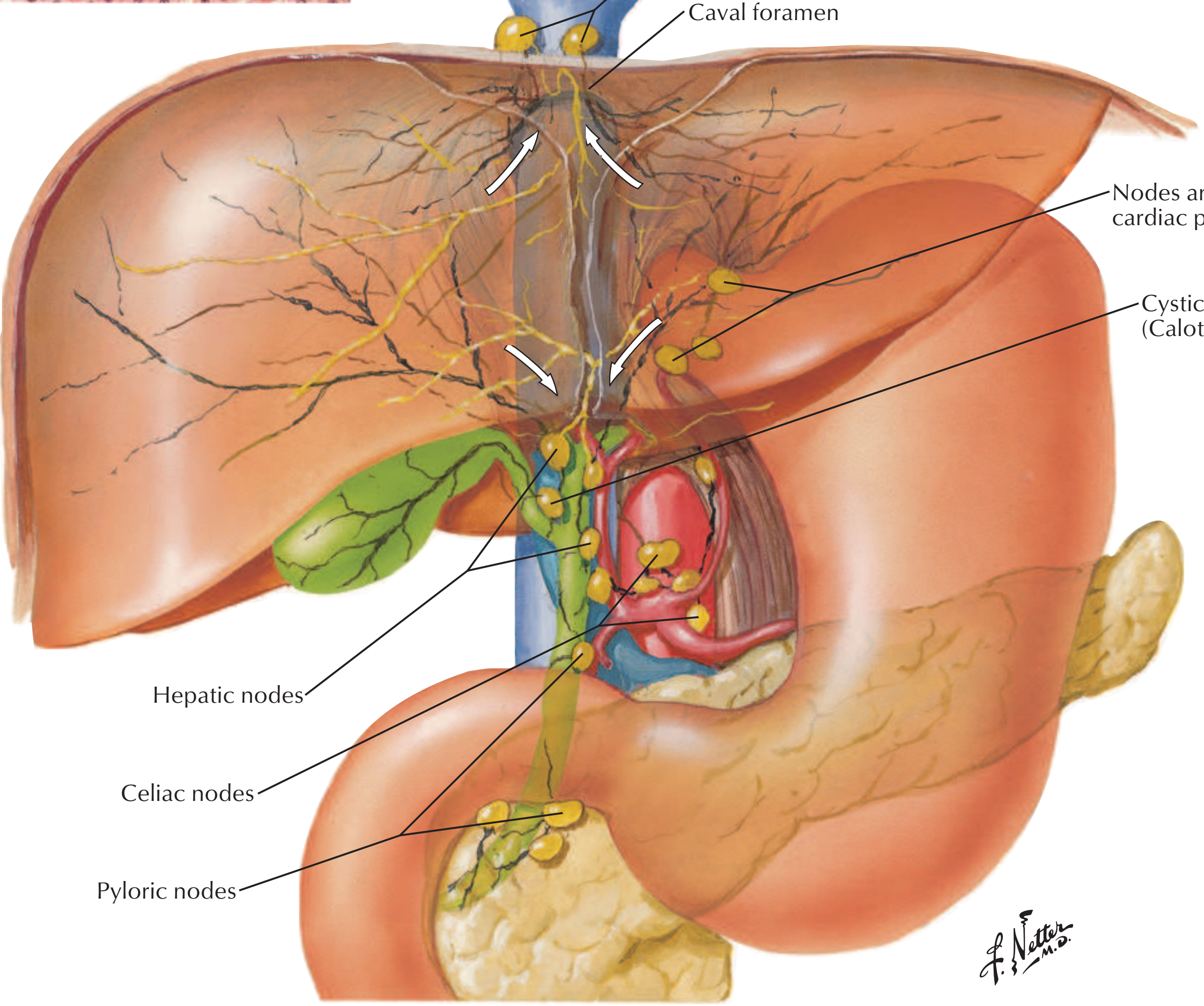

Epicolic nodes
Paracolic nodes
Middle colic nodes
Superior mesenteric nodes (central superior group)
Inferior mesenteric nodes
Left colic nodes
Right colic nodes
Preaortic nodes
Ileocolic nodes
Sigmoid nodes
Paracolic nodes
Prececal nodes
Superior rectal nodes
Appendicular nodes
Inferior mesenteric nodes
Left colic nodes
Preaortic nodes
Superior rectal nodes
Common iliac nodes
Internal iliac nodes
Middle rectal nodes
External iliac nodes
Middle rectal nodes
Superficial inguinal nodes
Perineal lymph vessels (drain largely to inguinal nodes)

Lymph Vessels and Nodes of Liver

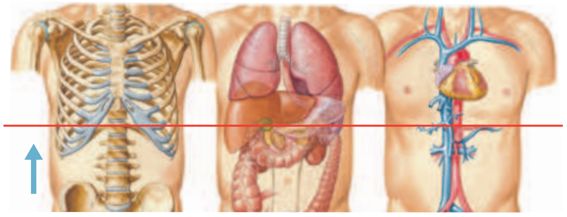

Low-power sections of liver

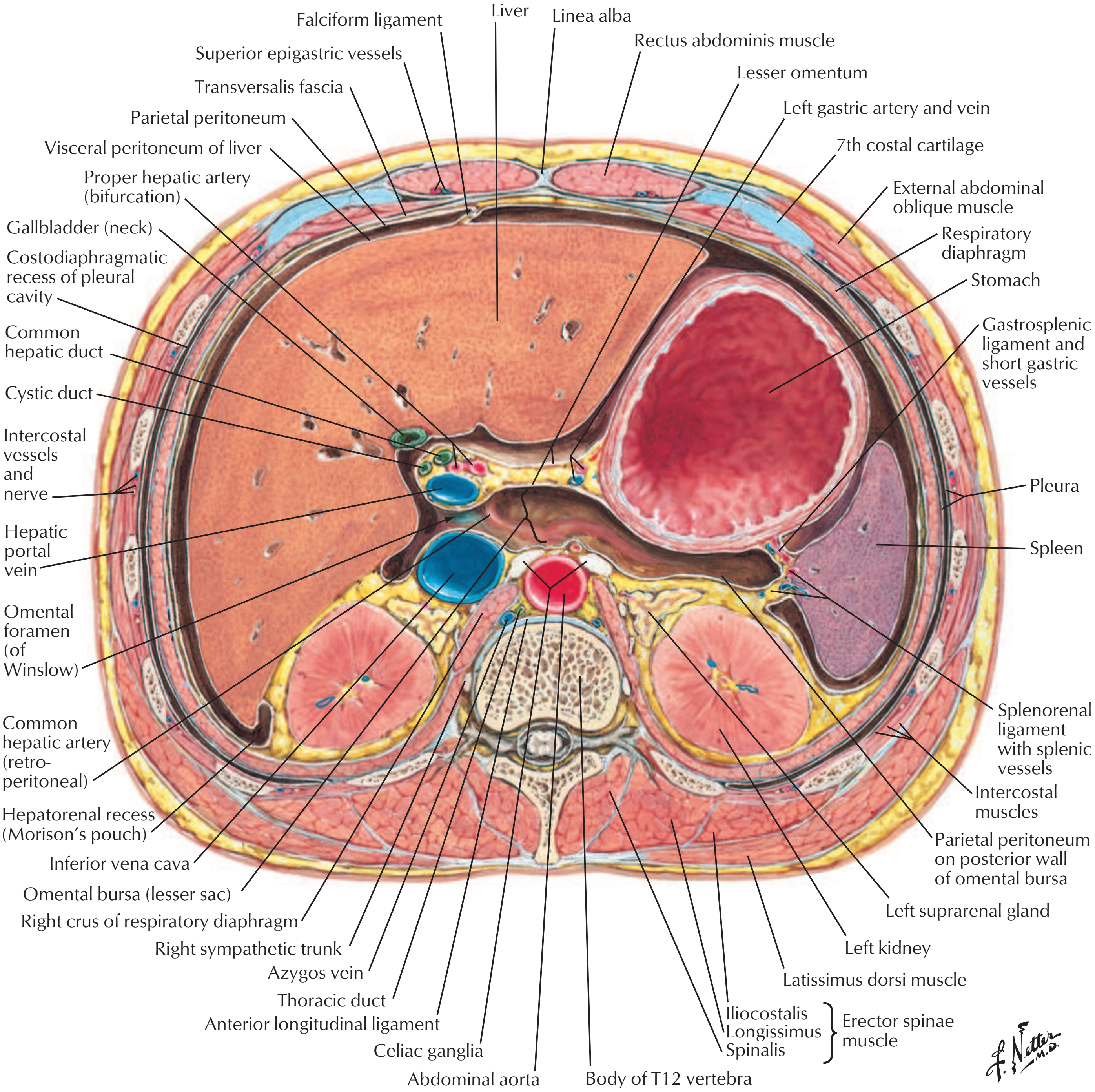
Perisinusoidal spaces (Disse) very narrow or obliterated
Perisinusoidal spaces (Disse) markedly widened


Connective tissue of portal triad
Perisinusoidal space (Disse)
Sinusoid
Periportal space (Mall)
Terminal lymphatic vessel

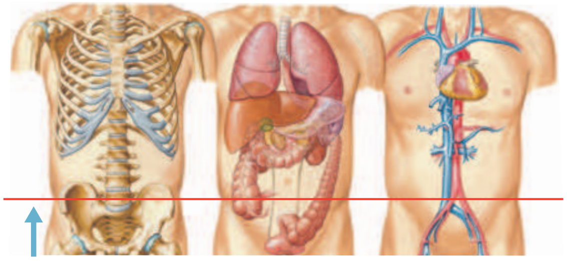

Superior phrenic nodes (at termination of inferior vena cava)
Caval foramen
Nodes around cardiac part
Cystic node (Calot)
Hepatic nodes
Celiac nodes
Pyloric nodes

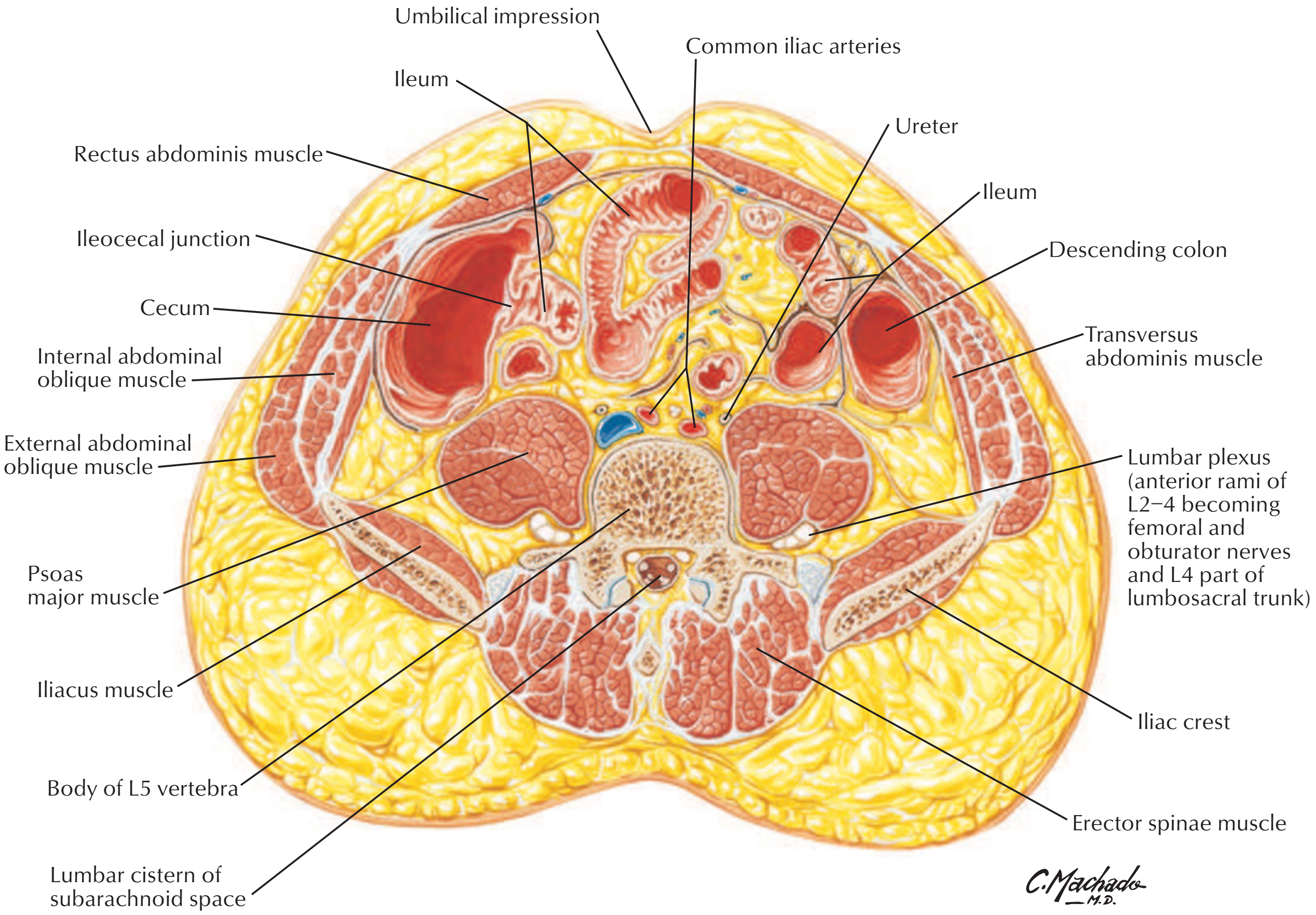
Schematic Cross Section of Abdomen at Middle T12

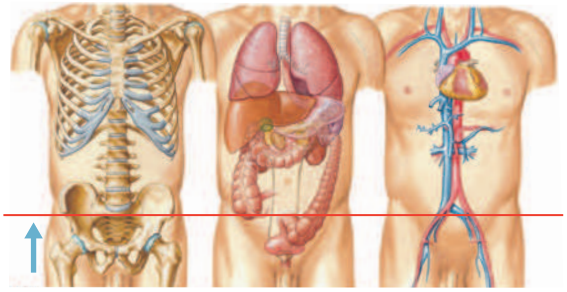


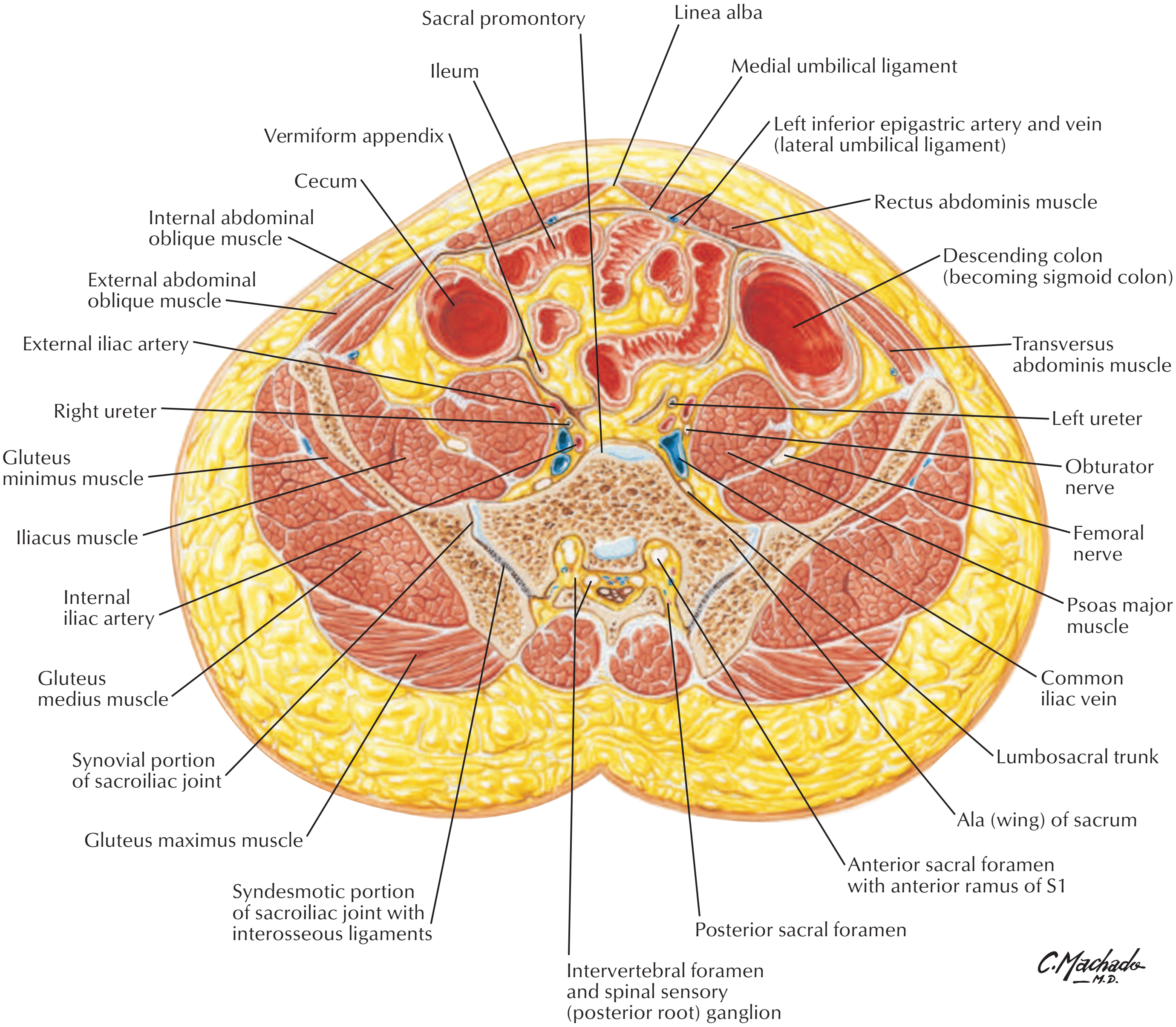

Falciform ligament
Liver
Linea alba
Rectus abdominis muscle
Superior epigastric vessels
Lesser omentum
Transversalis fascia
Left gastric artery and vein
Parietal peritoneum
7th costal cartilage
Visceral peritoneum of liver
External abdominal oblique muscle
Proper hepatic artery (bifurcation)
Respiratory diaphragm
Gallbladder (neck)
Stomach
Costodiaphragmatic recess of pleural cavity
Gastrosplenic ligament and short gastric vessels
Common hepatic duct
Cystic duct
Intercostal vessels and nerve
Pleura
Hepatic portal vein
Spleen
Omental foramen (of Winslow)
Splenorenal ligament with splenic vessels
Common hepatic artery (retro-peritoneal)
Intercostal muscles
Hepatorenal recess (Morison's pouch)
Parietal peritoneum on posterior wall of omental bursa
Inferior vena cava
Omental bursa (lesser sac)
Left suprarenal gland
Right crus of respiratory diaphragm
Left kidney
Right sympathetic trunk
Azygos vein
Latissimus dorsi muscle
Thoracic duct
Iliocostalis
Longissimus
Spinalis
Erector spinae muscle
Anterior longitudinal ligament
Celiac ganglia
Abdominal aorta
Body of T12 vertebra

Transverse Section of Abdomen: Level of L5, Near Transtubercular Plane

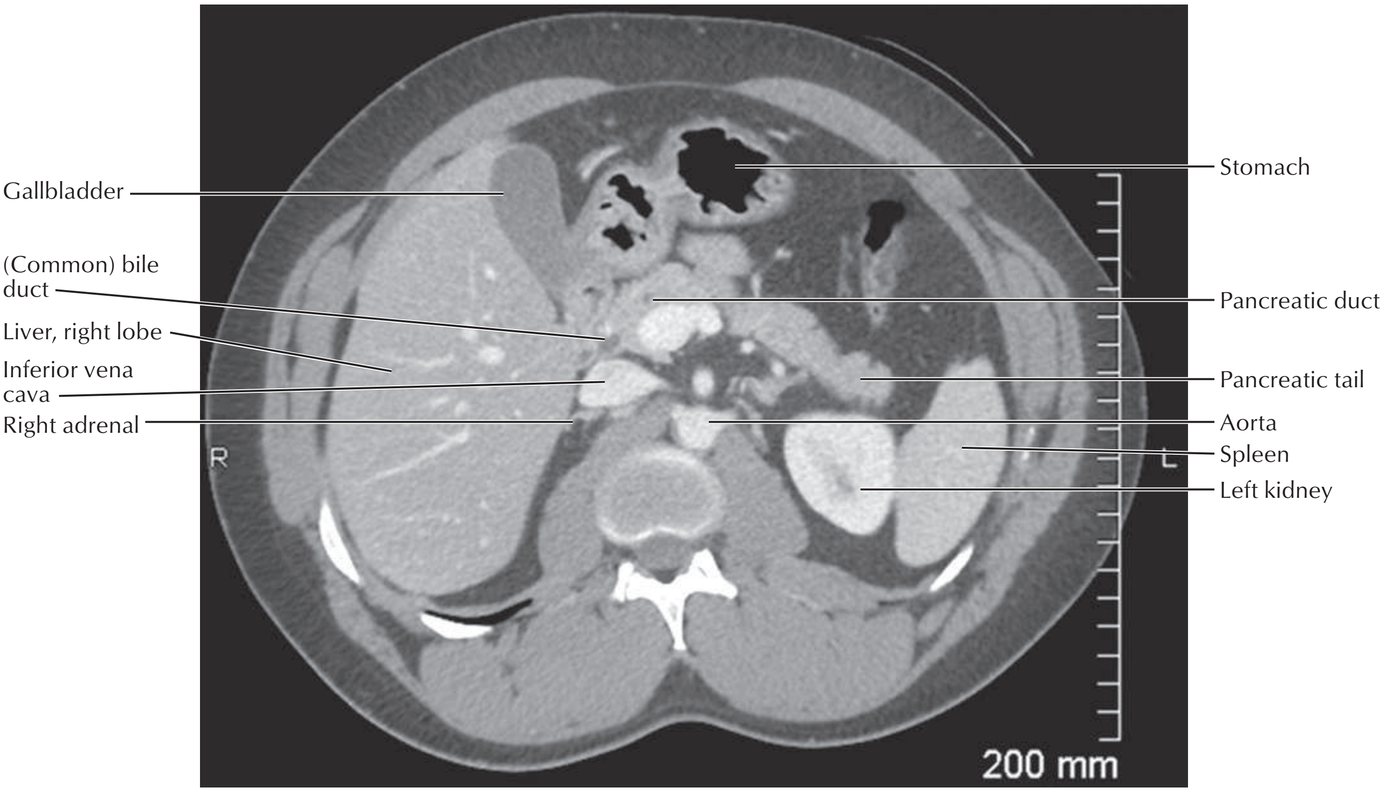



Umbilical impression
Common iliac arteries
Ileum
Ureter
Rectus abdominis muscle
Ileum
Ileocecal junction
Descending colon
Cecum
Transversus abdominis muscle
Internal abdominal oblique muscle
External abdominal oblique muscle
Lumbar plexus (anterior rami of L2–4 becoming femoral and obturator nerves and L4 part of lumbosacral trunk)
Psoas major muscle
Iliacus muscle
Iliac crest
Body of L5 vertebra
Erector spinae muscle
Lumbar cistern of subarachnoid space
C. Machado M.D.




Sacral promontory
Linea alba
Ileum
Medial umbilical ligament
Vermiform appendix
Left inferior epigastric artery and vein (lateral umbilical ligament)
Cecum
Rectus abdominis muscle
Internal abdominal oblique muscle
Descending colon (becoming sigmoid colon)
External abdominal oblique muscle
External iliac artery
Transversus abdominis muscle
Right ureter
Left ureter
Gluteus minimus muscle
Obturator nerve
Iliacus muscle
Femoral nerve
Internal iliac artery
Psoas major muscle
Gluteus medius muscle
Common iliac vein
Synovial portion of sacroiliac joint
Lumbosacral trunk
Ala (wing) of sacrum
Gluteus maximus muscle
Anterior sacral foramen with anterior ramus of S1
Syndesmotic portion of sacroiliac joint with interosseous ligaments
Posterior sacral foramen
Intervertebral foramen and spinal sensory (posterior root) ganglion
C. Machado M.D.

Axial CT image enhanced with intravenous contrast


Gallbladder
(Common) bile duct
Liver, right lobe
Inferior vena cava
Right adrenal
Stomach
Pancreatic duct
Pancreatic tail
Aorta
Spleen
Left kidney
R
L
200 mm

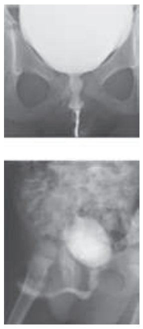
PELVIS AND PERINEUM

6

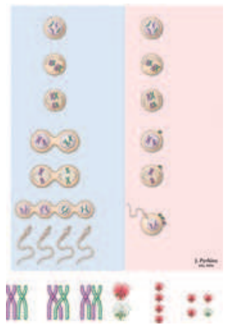
Surface Anatomy 333
Bones and Ligaments 334-338
Pelvic Floor and Contents 339-349
Urinary Bladder 350-352
Uterus, Vagina, and Supporting Structures 353-357
Perineum and External Genitalia: Female 358-361
Perineum and External Genitalia: Male 362-369
Homologues of Genitalia 370-371
Testis, Epididymis, and Ductus Deferens 372
Rectum 373-378
Regional Scan 379
Vasculature 380-390
Innervation 391-399
Cross-Sectional Anatomy 400-401
Structures With High Clinical Significance Tables 6.1-6.2
Muscle Tables Tables 6.3-6.4
Electronic Bonus Plates BP88-BP98

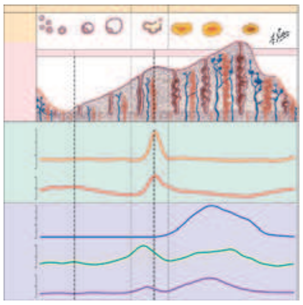
ELECTRONIC BONUS PLATES

BP88 Fasciae of Male and Female Pelvis and Perineum


BP89 Male and Female Cystourethrograms

BP90 Female Urethra


BP91 Genetics of Reproduction

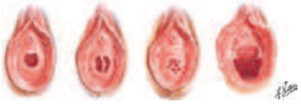

BP92 Menstrual Cycle

BP93 Testes

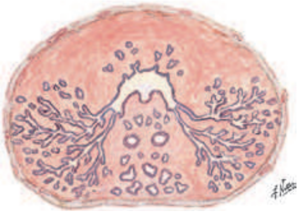
BP94 Uterine Development

BP95 Ovary, Ova, and Follicles

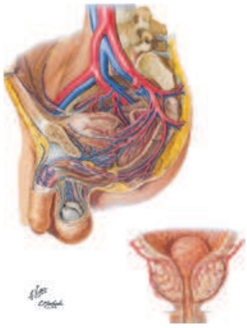
ELECTRONIC BONUS PLATES—*cont'd*



BP96 Variations in Hymen

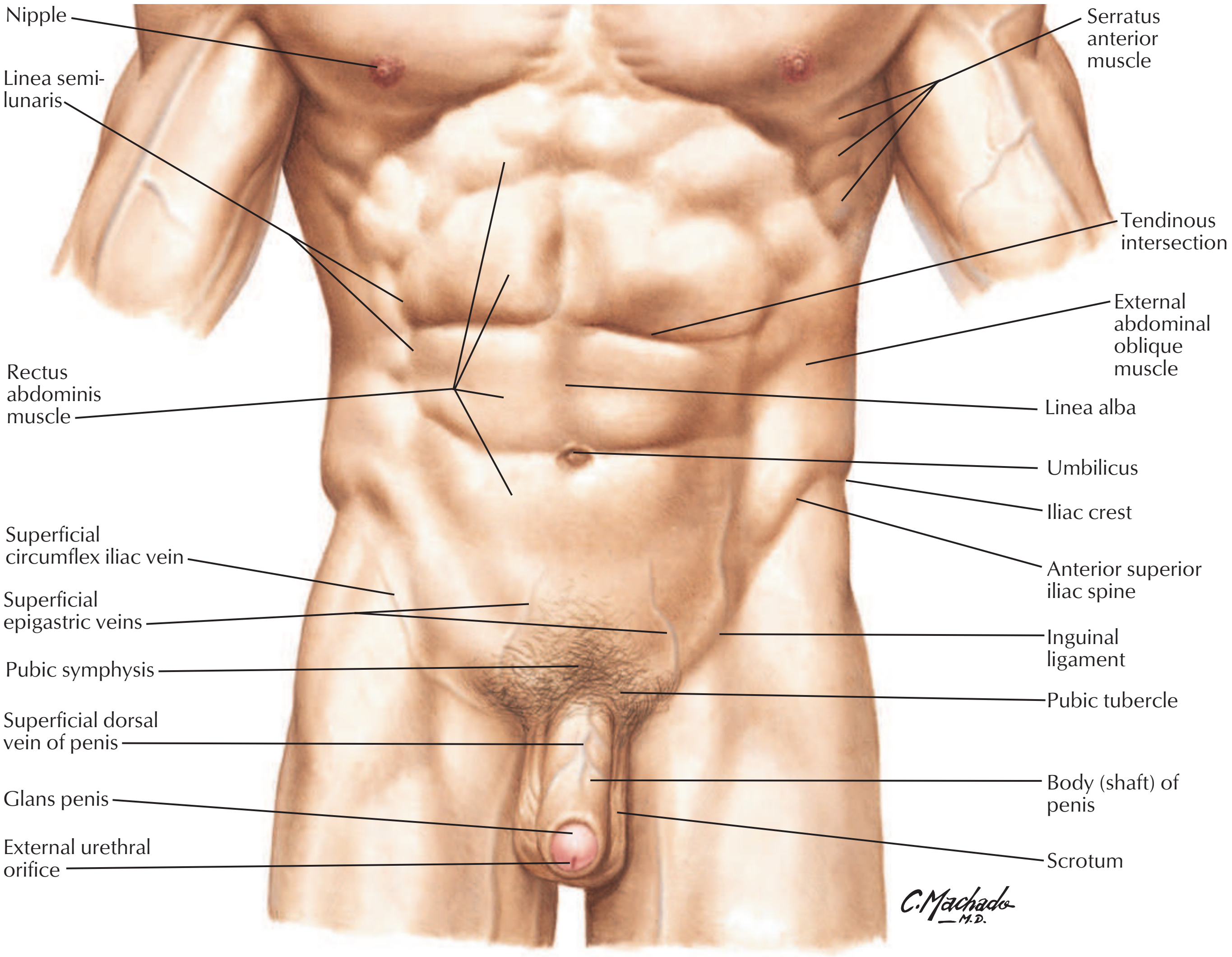


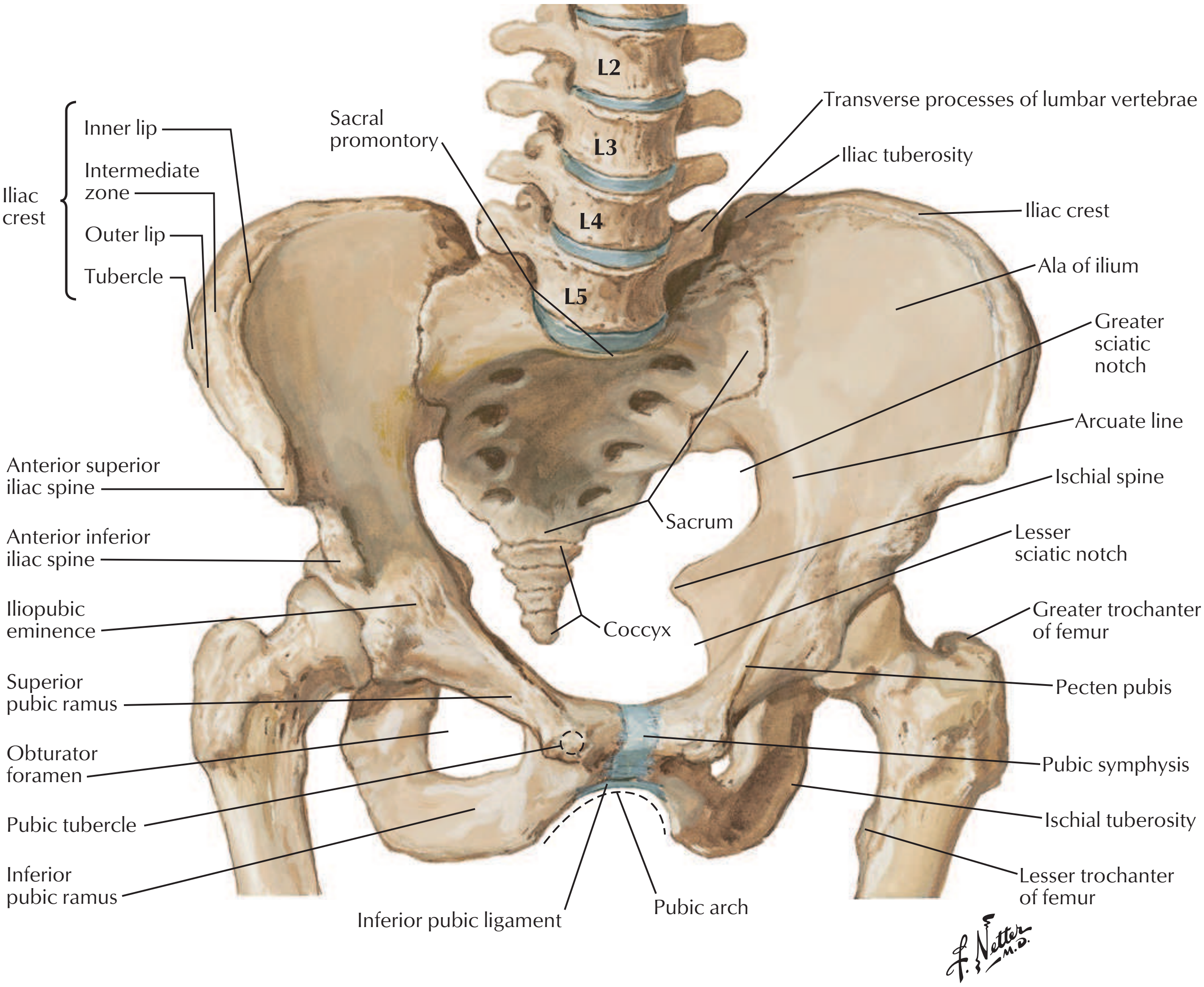
BP97 Cross Section Through Prostate



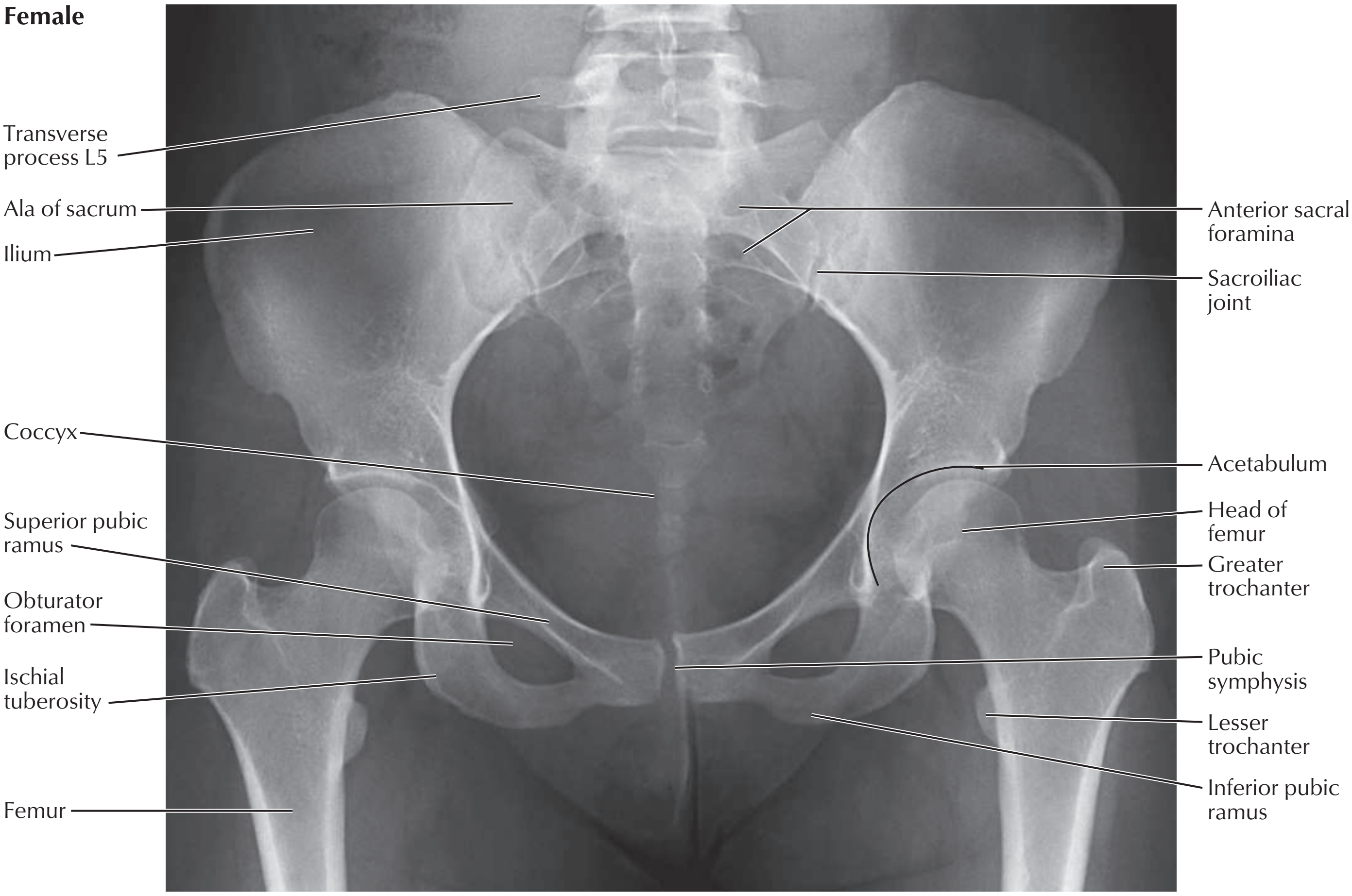
BP98 Arteries and Veins of Pelvis: Male

See also Plates 171, 252

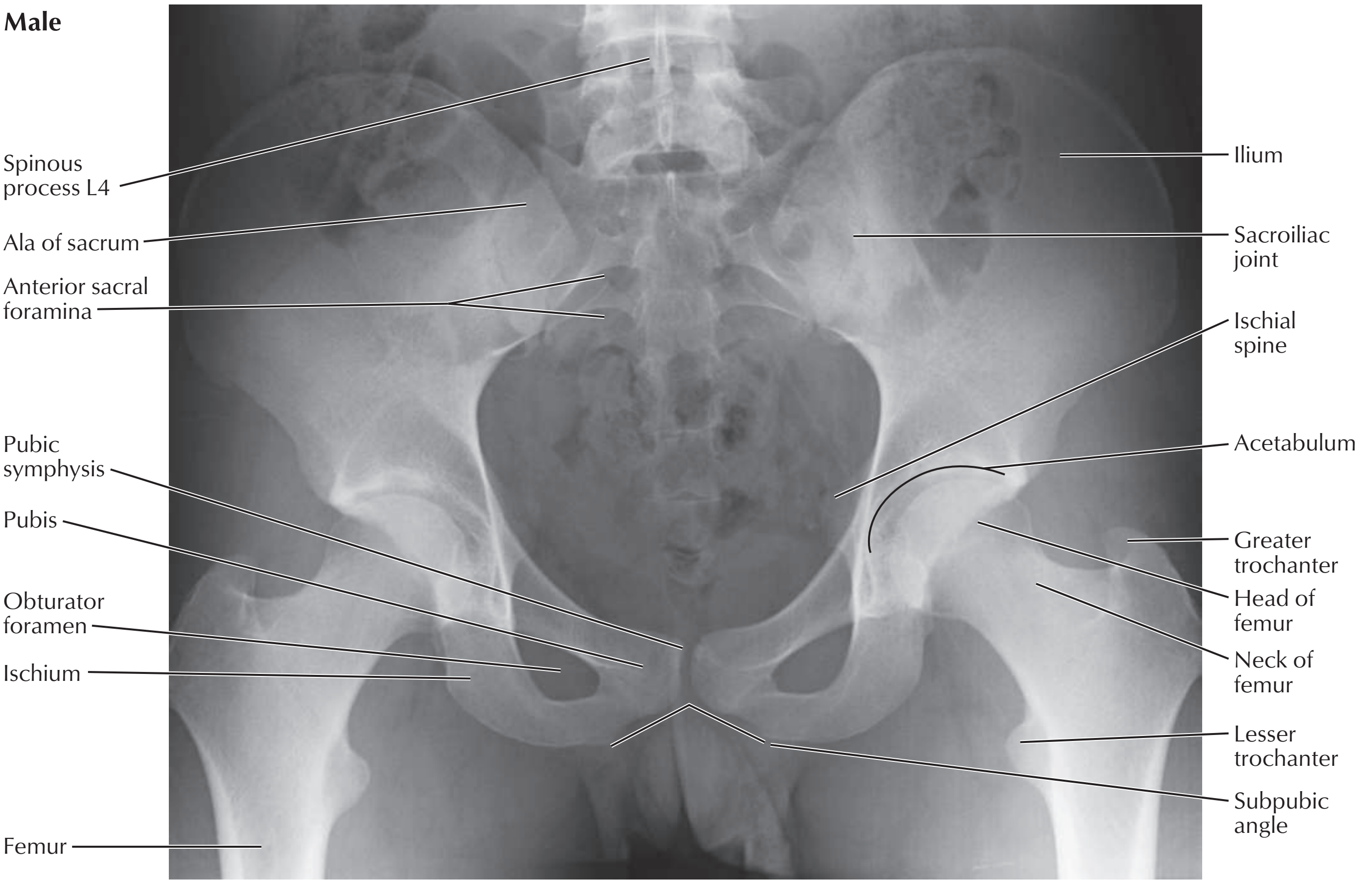

Nipple
Linea semi-lunaris
Serratus anterior muscle
Tendinous intersection
External abdominal oblique muscle
Rectus abdominis muscle
Linea alba
Umbilicus
Iliac crest
Anterior superior iliac spine
Superficial circumflex iliac vein
Superficial epigastric veins
Inguinal ligament
Pubic symphysis
Pubic tubercle
Superficial dorsal vein of penis
Body (shaft) of penis
Glans penis
External urethral orifice
Scrotum
C.Machado M.D.


Iliac crest
Inner lip
Intermediate zone
Outer lip
Tubercle
Sacral promontory
L2
L3
L4
L5
Transverse processes of lumbar vertebrae
Iliac tuberosity
Iliac crest
Ala of ilium
Greater sciatic notch
Arcuate line
Ischial spine
Lesser sciatic notch
Greater trochanter of femur
Pecten pubis
Pubic symphysis
Ischial tuberosity
Lesser trochanter of femur
Anterior superior iliac spine
Anterior inferior iliac spine
Iliopubic eminence
Superior pubic ramus
Obturator foramen
Pubic tubercle
Inferior pubic ramus
Sacrum
Coccyx
Inferior pubic ligament
Pubic arch
F. Netter M.D.

Female

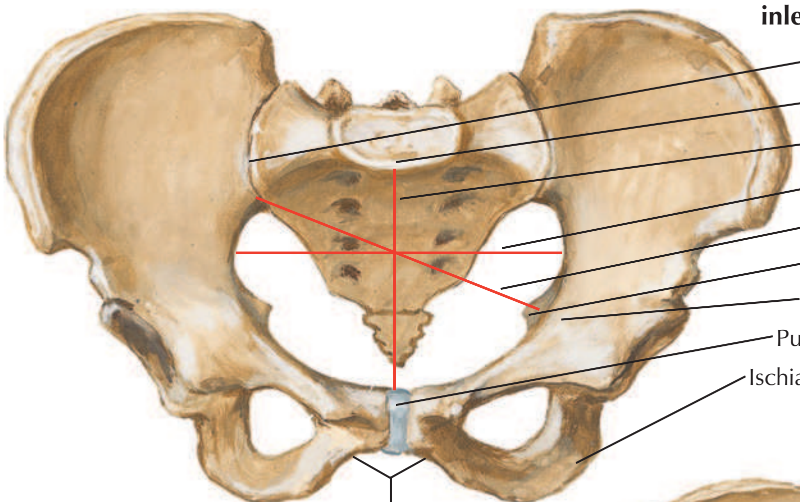

Transverse process L5
Ala of sacrum
Ilium
Coccyx
Superior pubic ramus
Obturator foramen
Ischial tuberosity
Femur
Anterior sacral foramina
Sacroiliac joint
Acetabulum
Head of femur
Greater trochanter
Pubic symphysis
Lesser trochanter
Inferior pubic ramus

Male


Spinous process L4
Ala of sacrum
Anterior sacral foramina
Pubic symphysis
Pubis
Obturator foramen
Ischium
Femur
Ilium
Sacroiliac joint
Ischial spine
Acetabulum
Greater trochanter
Head of femur
Neck of femur
Lesser trochanter
Subpubic angle

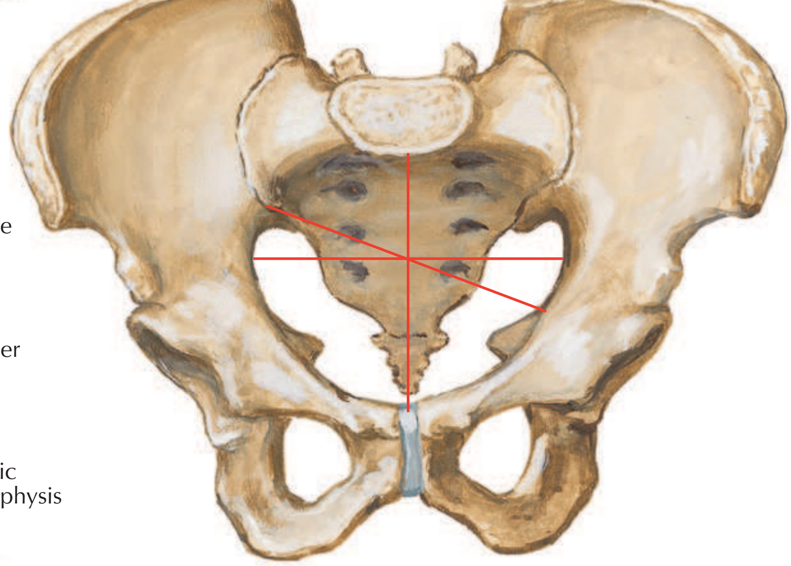
Sex Differences of Pelvis: Measurements

See also Plate 250



Female pelvis/female pelvic inlet: anterior view

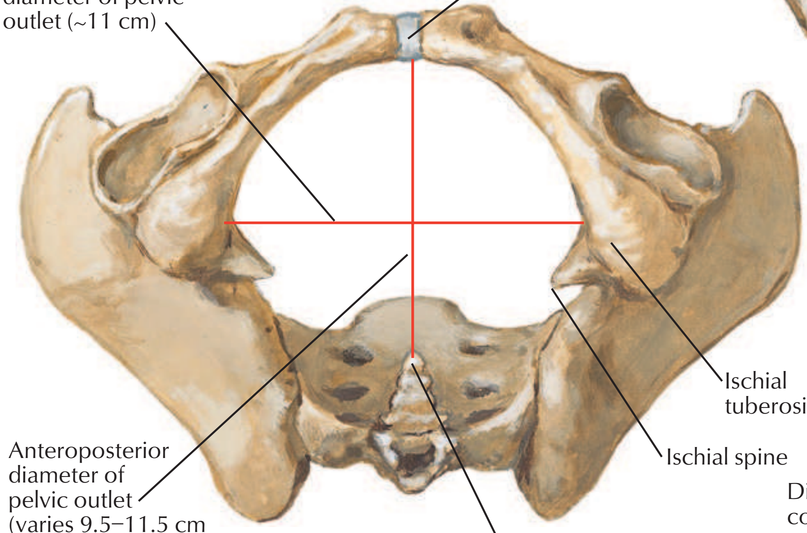
Sacroiliac joint
Sacral promontory
Diagonal conjugate (~12 cm)
Transverse (~13 cm)
Oblique (~12.5 cm)
Diameters of the pelvis
Ischial spine
Iliopubic eminence
Pubic symphysis
Ischial tuberosity
Pubic arch



Male pelvis/male pelvic inlet: anterior view

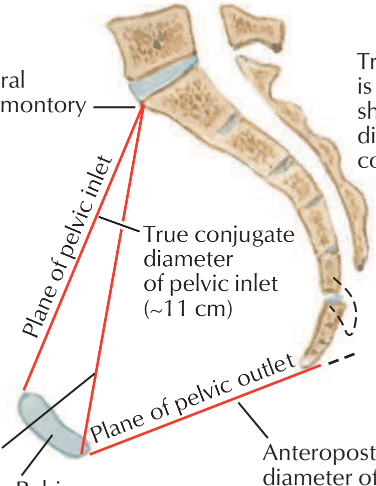
Diagonal conjugate is only diameter of pelvic inlet that can be measured clinically

- All measurements slightly shorter in relation to body size than in female
- Pelvic inlet oriented more anteroposteriorly than in female, where it tends to be transversely oval
- Pubic symphysis deeper (taller)
- Pubic arch (subpubic angle) narrower
- Ischial tuberosities less far apart
- Iliac wings less flared



Transverse diameter of pelvic outlet (~11 cm)
Pubic symphysis
Ischial tuberosity
Ischial spine
Anteroposterior diameter of pelvic outlet (varies 9.5–11.5 cm because of mobility of coccyx)
Tip of coccyx

Female pelvis/female pelvic outlet: inferior view



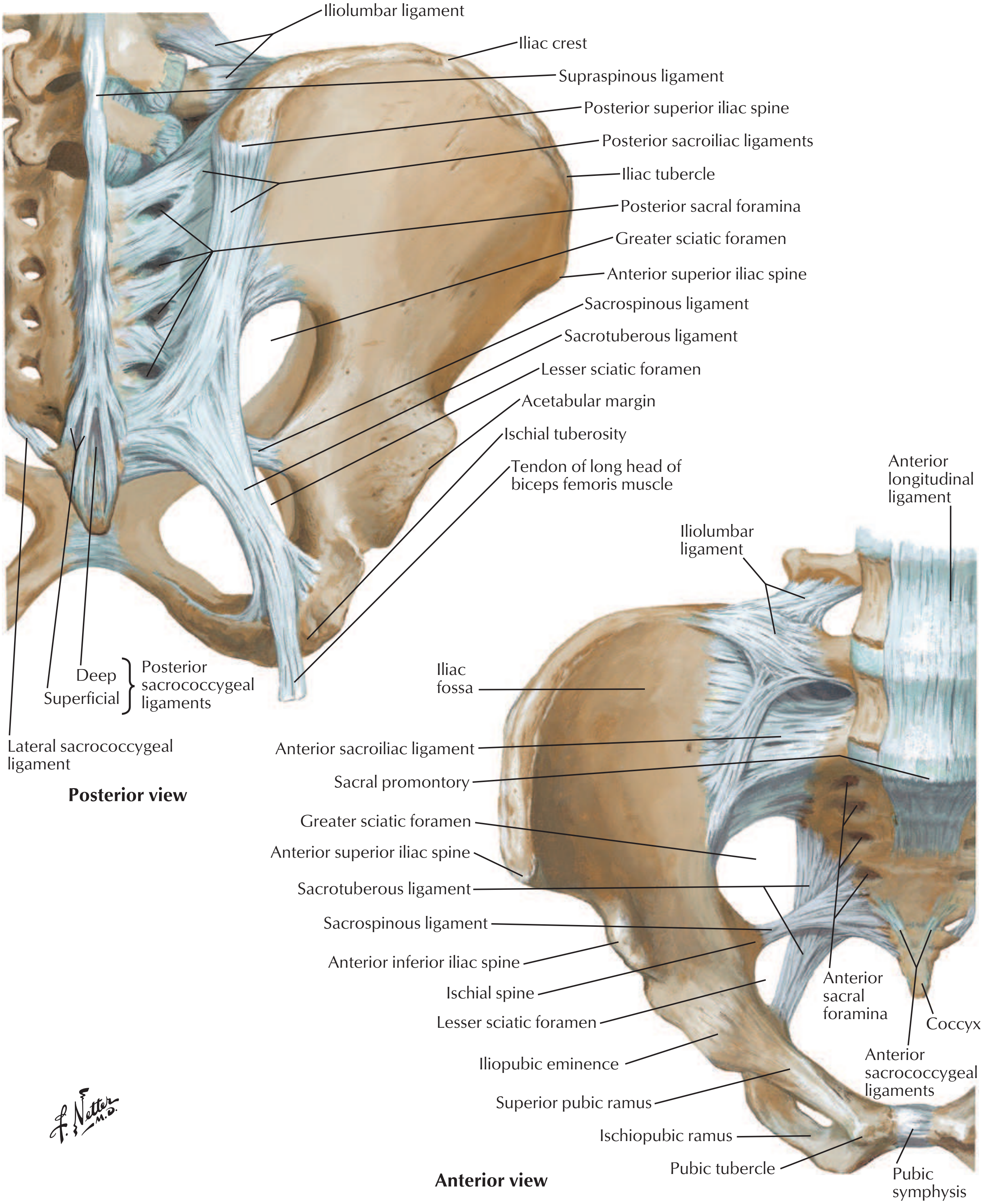
Sacral promontory
True conjugate is ~1.5 cm shorter than diagonal conjugate
Plane of pelvic inlet
True conjugate diameter of pelvic inlet (~11 cm)
Plane of pelvic outlet
Diagonal conjugate
Pubic symphysis
Anteroposterior diameter of pelvic outlet (9.5–11.5 cm)

Transverse diameter is the widest distance of pelvic inlet

Female: sagittal section

Bones and Ligaments of Pelvis

See also Plate 167


Iliolumbar ligament
Iliac crest
Supraspinous ligament
Posterior superior iliac spine
Posterior sacroiliac ligaments
Iliac tubercle
Posterior sacral foramina
Greater sciatic foramen
Anterior superior iliac spine
Sacrospinous ligament
Sacrotuberous ligament
Lesser sciatic foramen
Acetabular margin
Ischial tuberosity
Tendon of long head of biceps femoris muscle
Deep
Superficial
Posterior sacrococcygeal ligaments
Lateral sacrococcygeal ligament
Anterior longitudinal ligament
Iliolumbar ligament
Iliac fossa
Anterior sacroiliac ligament
Sacral promontory
Greater sciatic foramen
Anterior superior iliac spine
Sacrotuberous ligament
Sacrospinous ligament
Anterior inferior iliac spine
Ischial spine
Lesser sciatic foramen
Iliopubic eminence
Superior pubic ramus
Ischiopubic ramus
Pubic tubercle
Anterior sacral foramina
Coccyx
Anterior sacrococcygeal ligaments
Pubic symphysis
F. Netter M.D.

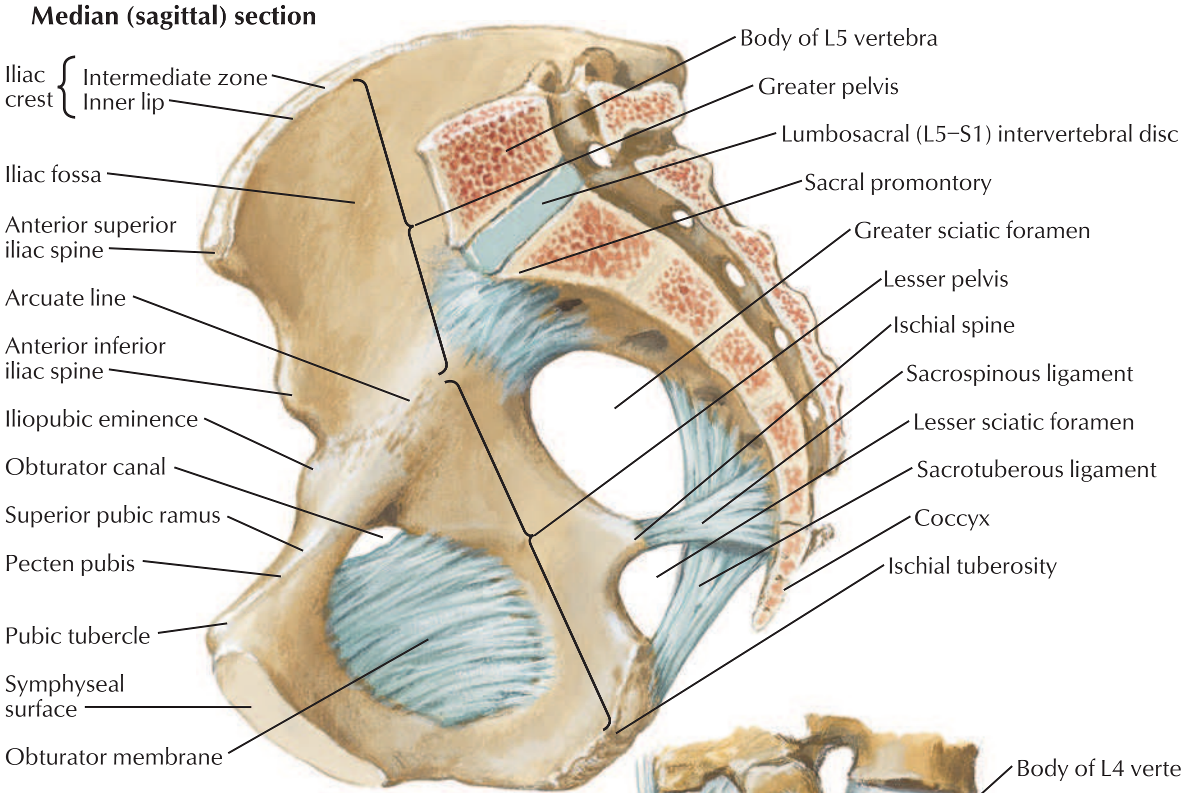
Posterior view

Anterior view

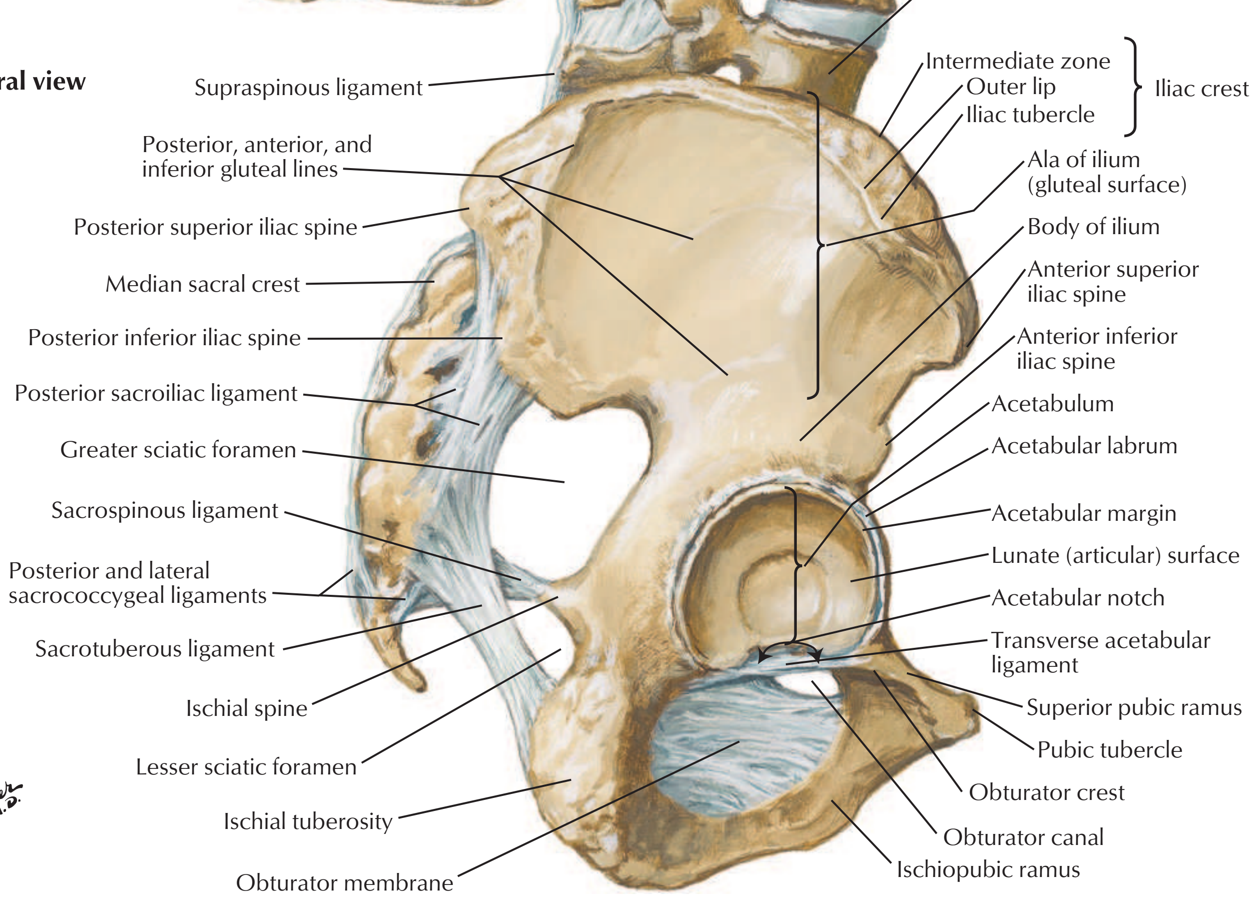
Bones and Ligaments of Pelvis (continued)

See also Plate 167

Median (sagittal) section


Iliac crest
Intermediate zone
Inner lip
Iliac fossa
Anterior superior iliac spine
Arcuate line
Anterior inferior iliac spine
Iliopubic eminence
Obturator canal
Superior pubic ramus
Pecten pubis
Pubic tubercle
Symphyseal surface
Obturator membrane
Body of L5 vertebra
Greater pelvis
Lumbosacral (L5–S1) intervertebral disc
Sacral promontory
Greater sciatic foramen
Lesser pelvis
Ischial spine
Sacrospinous ligament
Lesser sciatic foramen
Sacrotuberous ligament
Coccyx
Ischial tuberosity

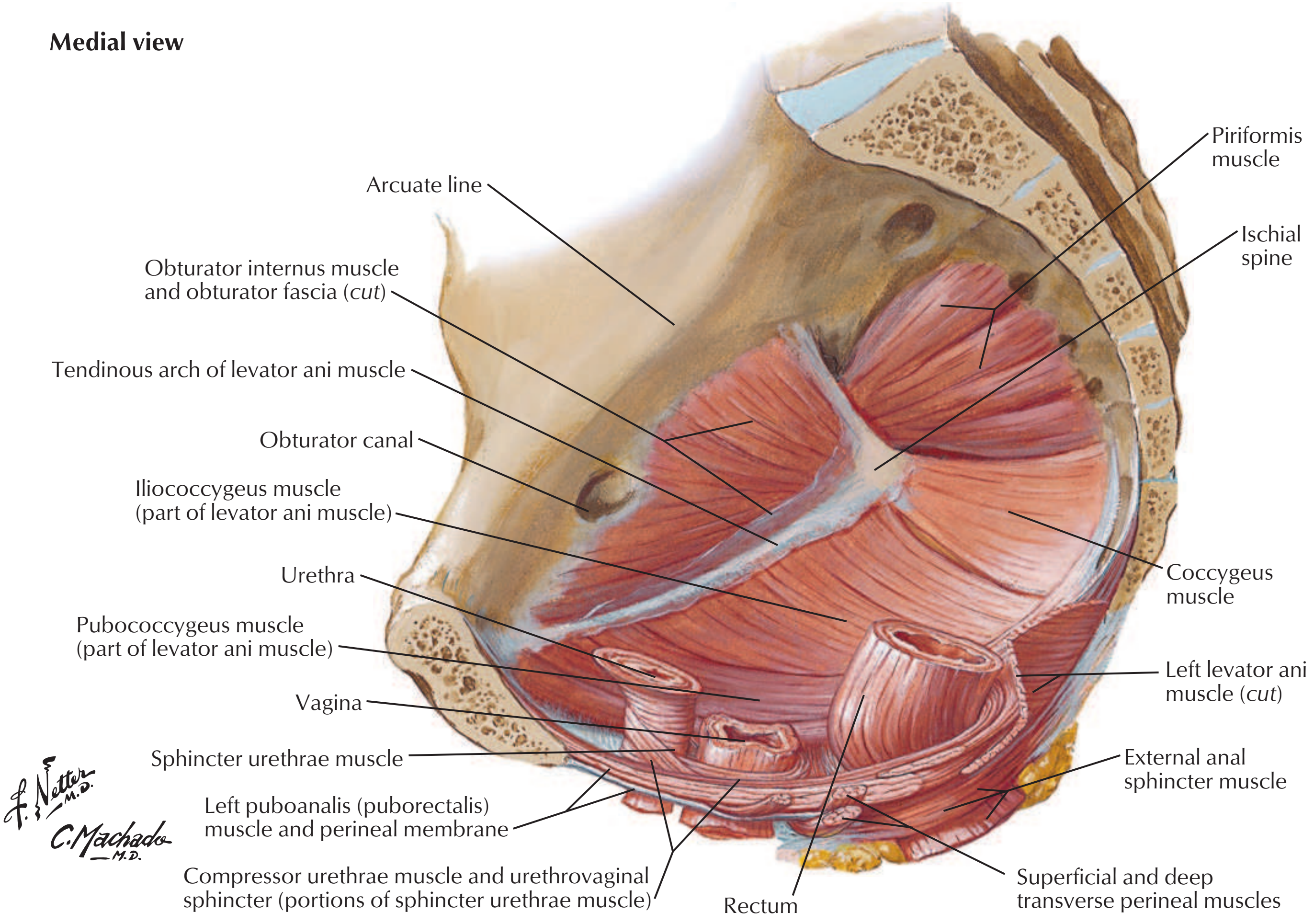
Lateral view


Supraspinous ligament
Posterior, anterior, and inferior gluteal lines
Posterior superior iliac spine
Median sacral crest
Posterior inferior iliac spine
Posterior sacroiliac ligament
Greater sciatic foramen
Sacrospinous ligament
Posterior and lateral sacrococcygeal ligaments
Sacrotuberous ligament
Ischial spine
Lesser sciatic foramen
Ischial tuberosity
Obturator membrane
Body of L4 vertebra
Intermediate zone
Outer lip
Iliac tubercle
Iliac crest
Ala of ilium (gluteal surface)
Body of ilium
Anterior superior iliac spine
Anterior inferior iliac spine
Acetabulum
Acetabular labrum
Acetabular margin
Lunate (articular) surface
Acetabular notch
Transverse acetabular ligament
Superior pubic ramus
Pubic tubercle
Obturator crest
Obturator canal
Ischiopubic ramus

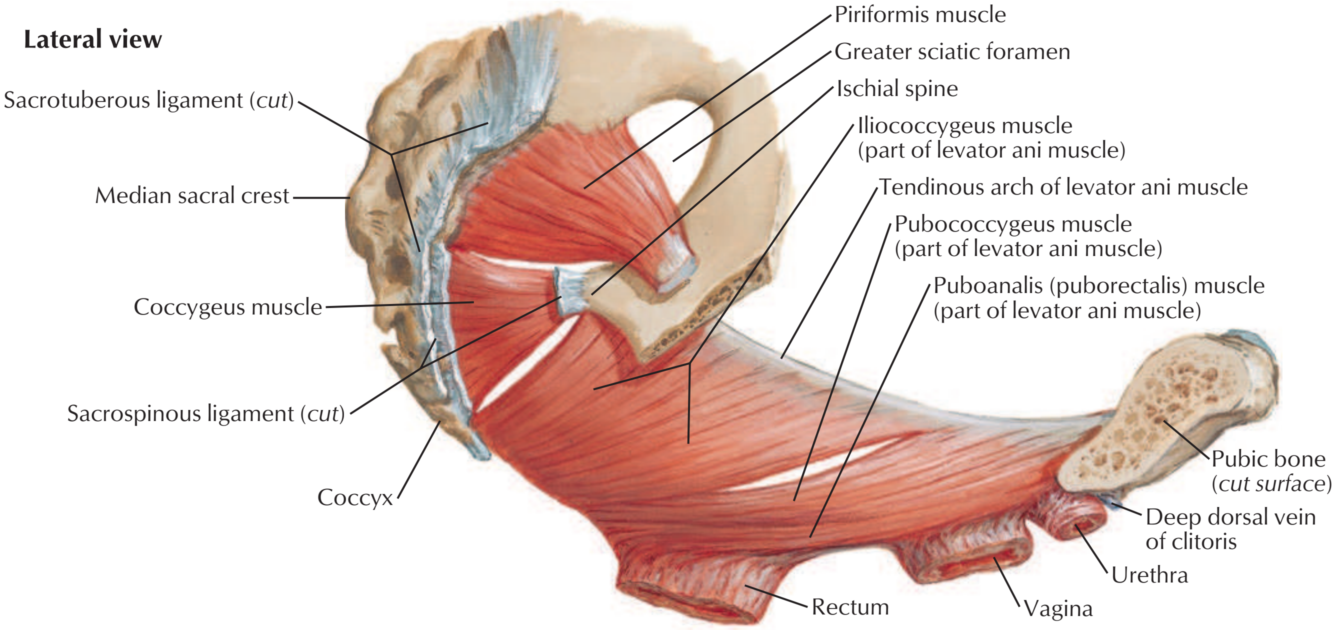
Pelvic Diaphragm: Female

See also Plate 373

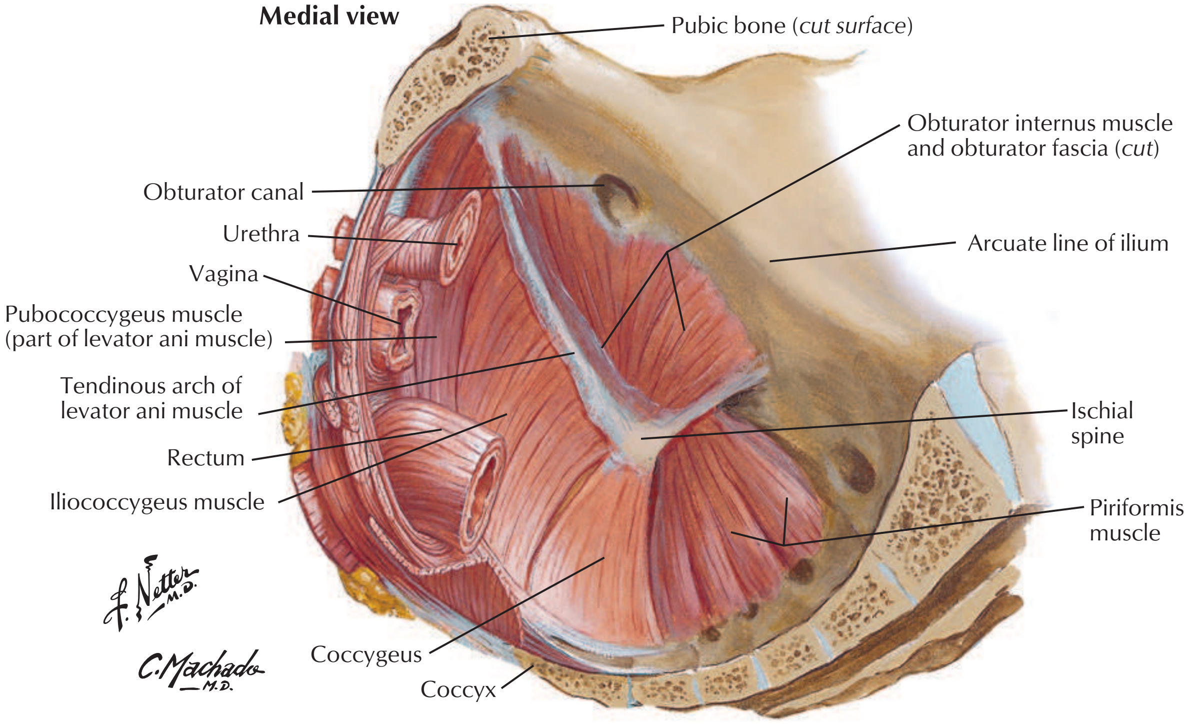
Medial view

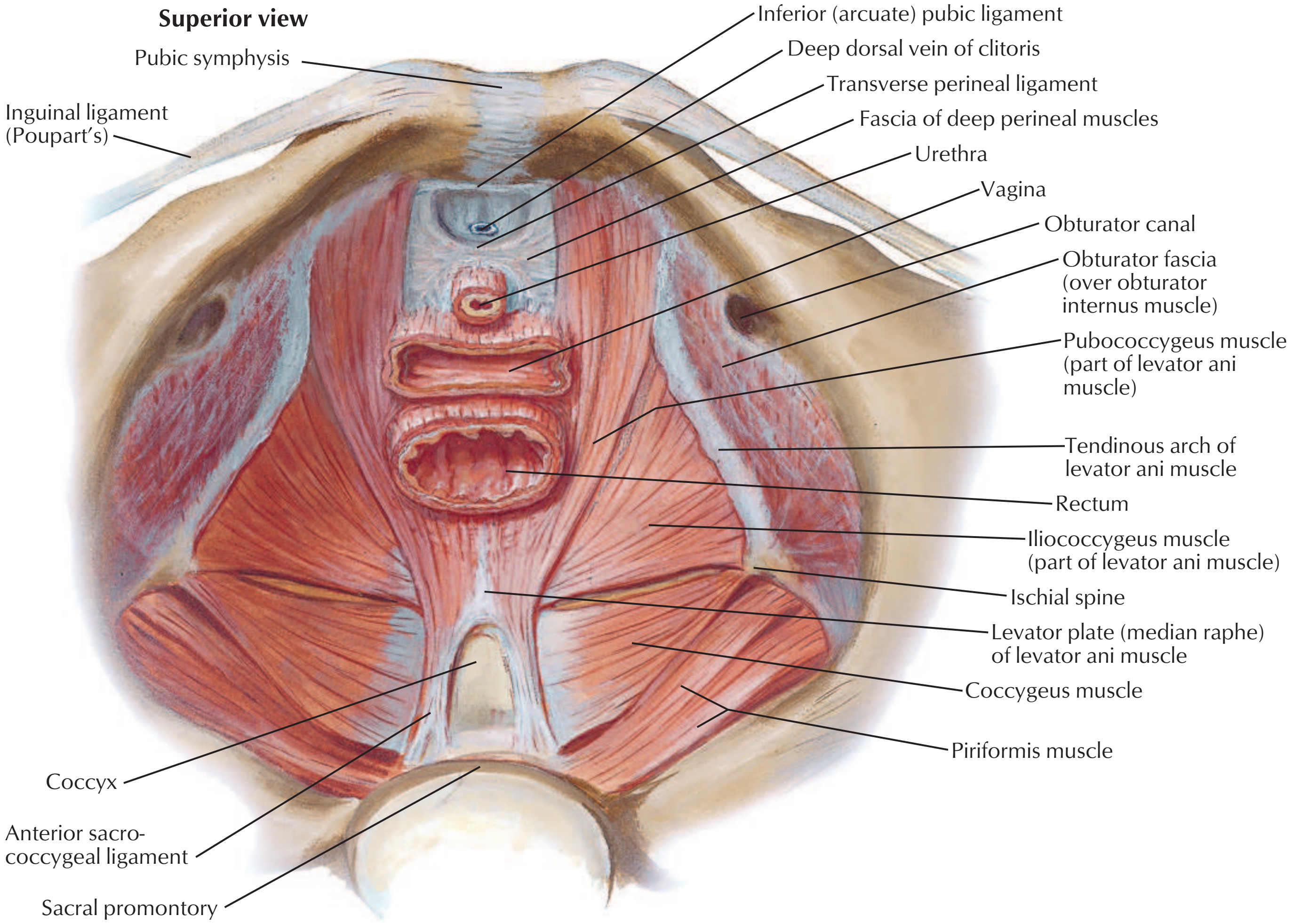

Piriformis muscle
Ischial spine
Arcuate line
Obturator internus muscle and obturator fascia (*cut*)
Tendinous arch of levator ani muscle
Obturator canal
Iliococcygeus muscle (part of levator ani muscle)
Coccygeus muscle
Urethra
Pubococcygeus muscle (part of levator ani muscle)
Left levator ani muscle (*cut*)
Vagina
Sphincter urethrae muscle
External anal sphincter muscle
F. Netter M.D.
C.Machado M.D.
Left puboanalis (puborectalis) muscle and perineal membrane
Compressor urethrae muscle and urethrovaginal sphincter (portions of sphincter urethrae muscle)
Rectum
Superficial and deep transverse perineal muscles

Lateral view

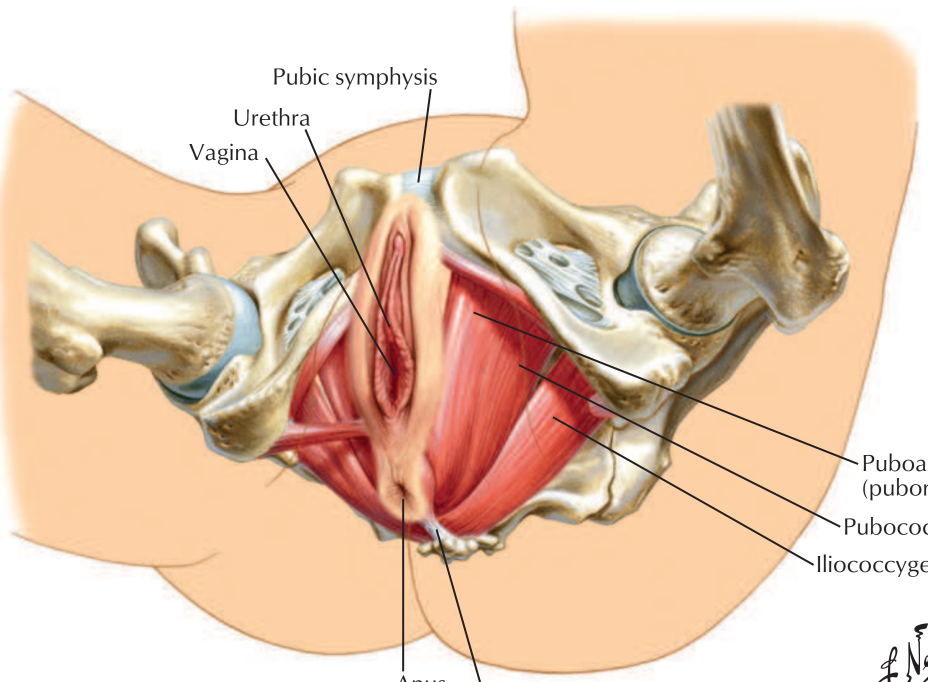

Piriformis muscle
Greater sciatic foramen
Ischial spine
Sacrotuberous ligament (*cut*)
Iliococcygeus muscle (part of levator ani muscle)
Median sacral crest
Tendinous arch of levator ani muscle
Pubococcygeus muscle (part of levator ani muscle)
Coccygeus muscle
Puboanalis (puborectalis) muscle (part of levator ani muscle)
Sacrospinous ligament (*cut*)
Pubic bone (*cut surface*)
Coccyx
Deep dorsal vein of clitoris
Urethra
Rectum
Vagina

For urogenital diaphragm see **Plate 360**


Medial view
Pubic bone (cut surface)
Obturator internus muscle and obturator fascia (cut)
Obturator canal
Urethra
Arcuate line of ilium
Vagina
Pubococcygeus muscle (part of levator ani muscle)
Tendinous arch of levator ani muscle
Ischial spine
Rectum
Piriformis muscle
Iliococcygeus muscle
F. Netter M.D.
C. Machado M.D.
Coccygeus
Coccyx

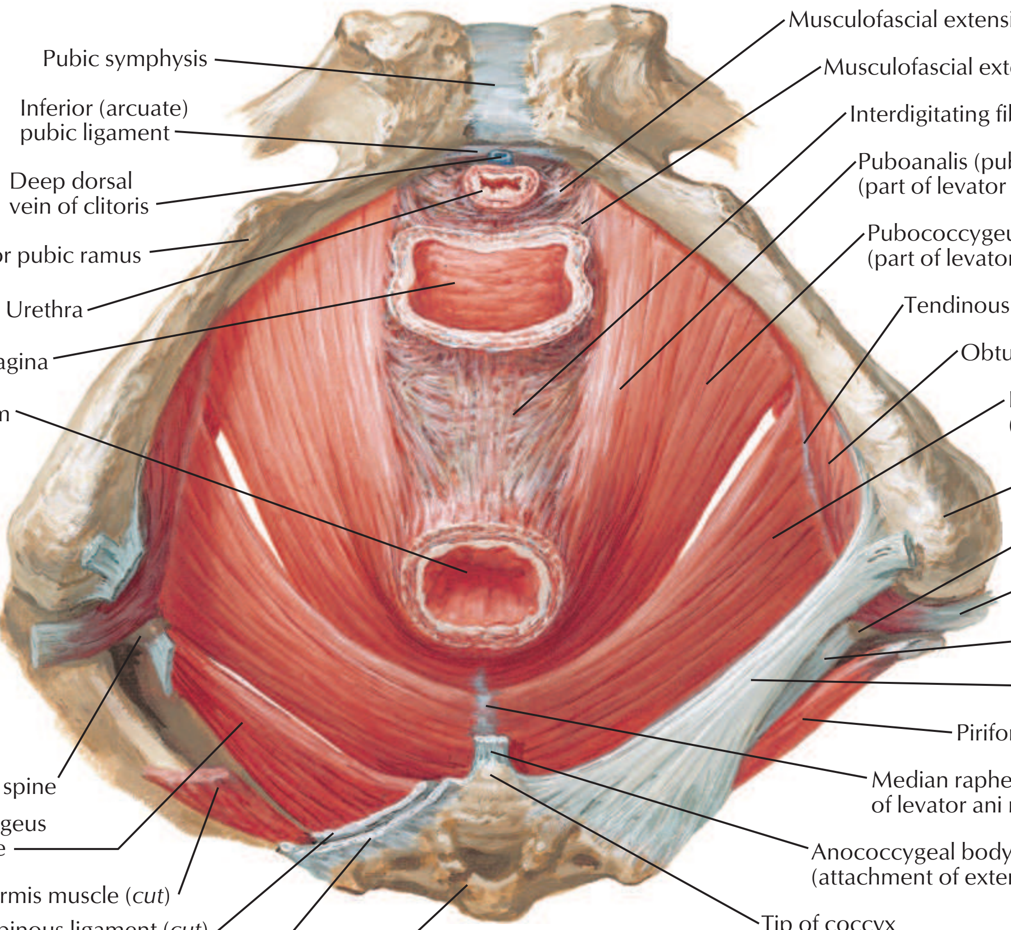

Superior view
Inferior (arcuate) pubic ligament
Pubic symphysis
Deep dorsal vein of clitoris
Transverse perineal ligament
Inguinal ligament (Poupart's)
Fascia of deep perineal muscles
Urethra
Vagina
Obturator canal
Obturator fascia (over obturator internus muscle)
Pubococcygeus muscle (part of levator ani muscle)
Tendinous arch of levator ani muscle
Rectum
Iliococcygeus muscle (part of levator ani muscle)
Ischial spine
Levator plate (median raphe) of levator ani muscle
Coccygeus muscle
Piriformis muscle
Coccyx
Anterior sacro-coccygeal ligament
Sacral promontory

See also Plate 361


Pubic symphysis
Urethra
Vagina
Puboanalis (puborectalis)
Pubococcygeus
Iliococcygeus
Levator ani muscle
Anus
Anococcygeal body (ligament)

F. Netter M.D.
C.Machado M.D.

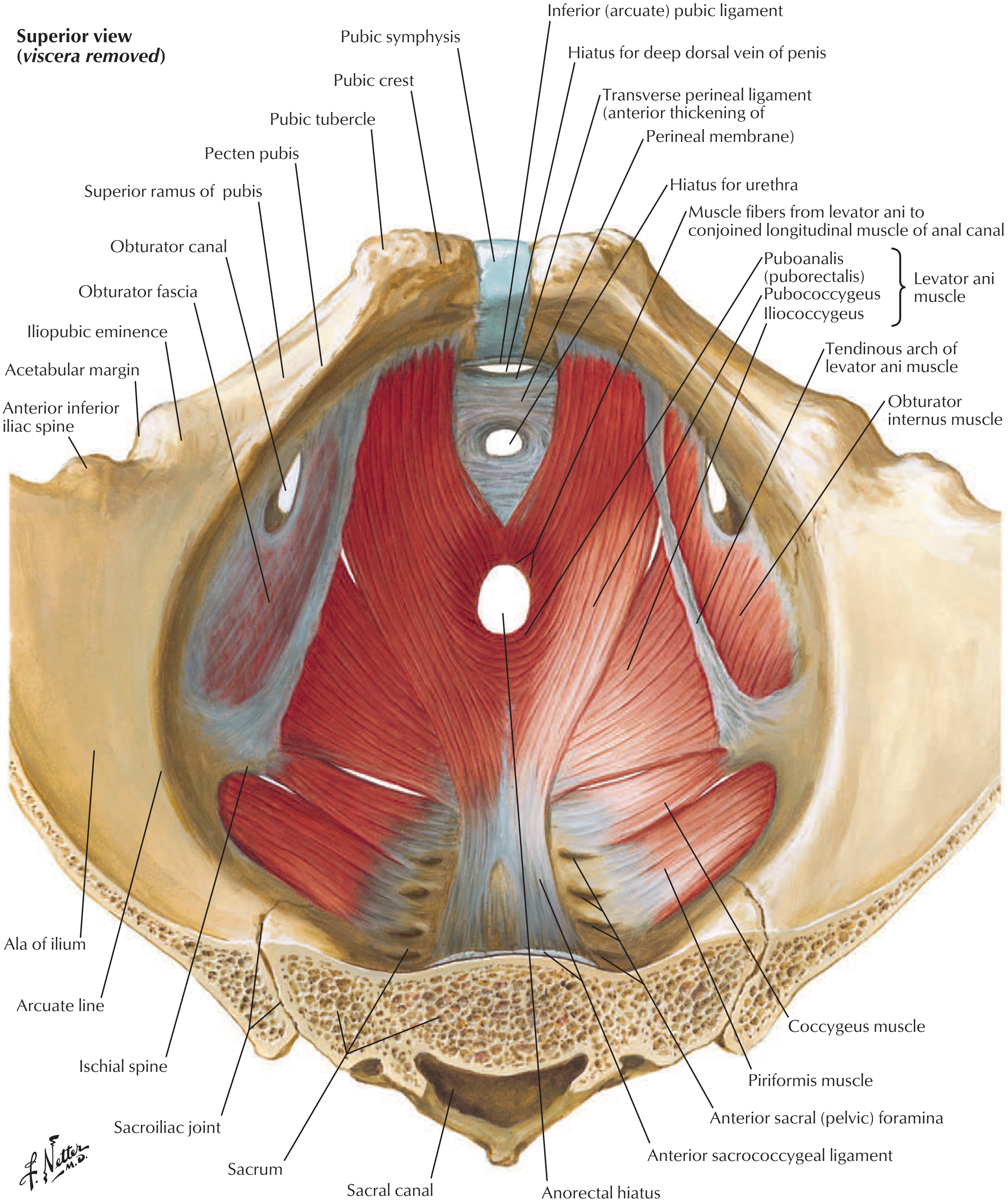
Inferior view


Pubic symphysis
Inferior (arcuate) pubic ligament
Deep dorsal vein of clitoris
Inferior pubic ramus
Urethra
Vagina
Rectum
Ischial spine
Coccygeus muscle
Piriformis muscle (cut)
Sacrospinous ligament (cut)
Sacrotuberous ligament (cut)
Sacrum
Musculofascial extensions to urethra
Musculofascial extensions to vagina
Interdigitating fibers of perineum
Puboanalis (puborectalis) muscle (part of levator ani muscle)
Pubococcygeus muscle (part of levator ani muscle)
Tendinous arch of levator ani muscle
Obturator internus muscle
Iliococcygeus muscle (part of levator ani muscle)
Ischial tuberosity
Ischial spine
Obturator internus tendon
Sacrospinous ligament
Sacrotuberous ligament
Piriformis muscle
Median raphe of levator ani muscle
Anococcygeal body (ligament) (attachment of external anal sphincter muscle)
Tip of coccyx

Pelvic Diaphragm: Male

See also **Plate 343**

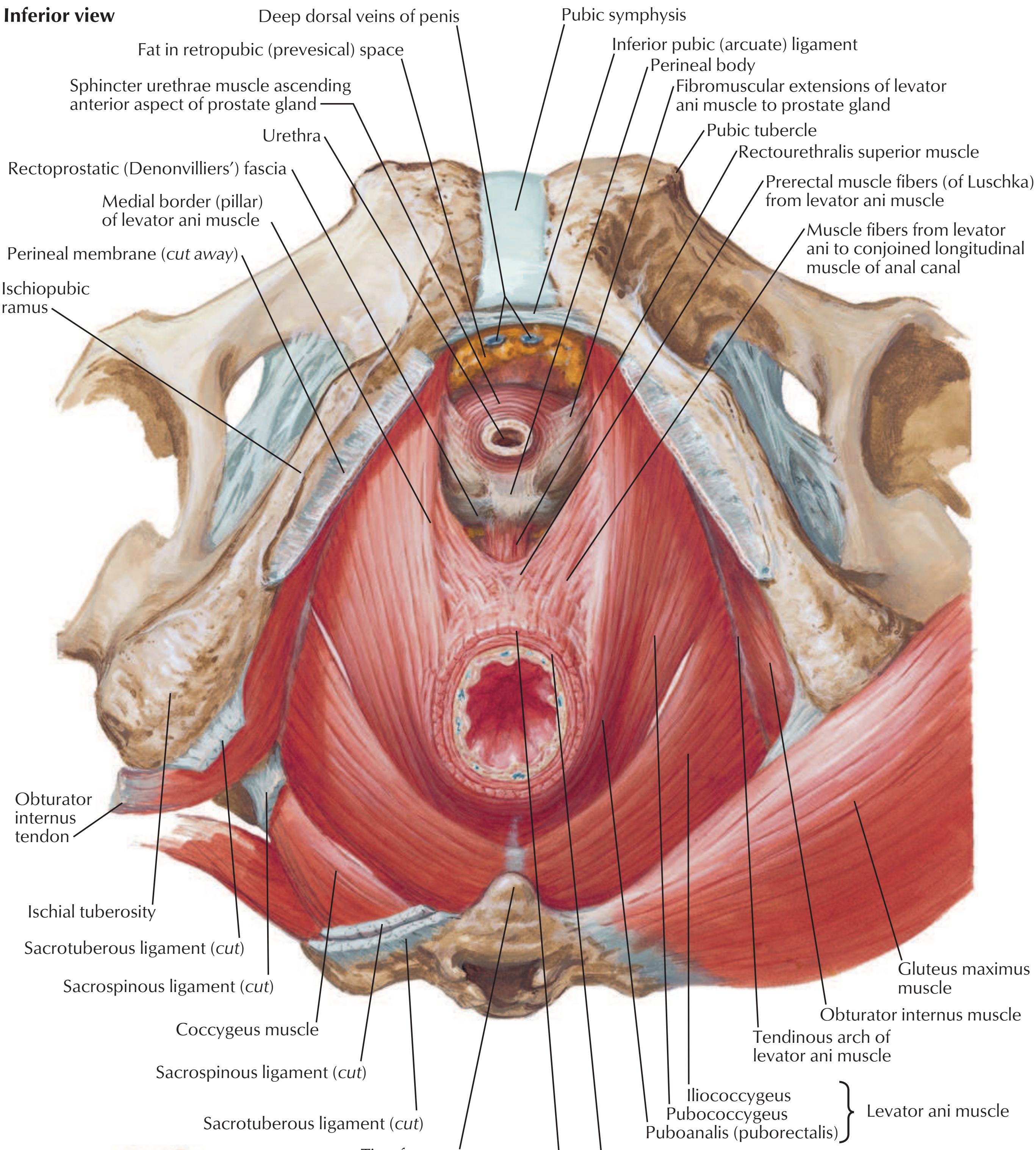
Superior view
(*viscera removed*)


Inferior (arcuate) pubic ligament
Pubic symphysis
Hiatus for deep dorsal vein of penis
Pubic crest
Transverse perineal ligament (anterior thickening of
Perineal membrane)
Pubic tubercle
Pecten pubis
Superior ramus of pubis
Hiatus for urethra
Muscle fibers from levator ani to conjoined longitudinal muscle of anal canal
Obturator canal
Puboanalis (puborectalis)
Pubococcygeus
Iliococcygeus
Levator ani muscle
Obturator fascia
Iliopubic eminence
Tendinous arch of levator ani muscle
Acetabular margin
Obturator internus muscle
Anterior inferior iliac spine
Ala of ilium
Arcuate line
Coccygeus muscle
Ischial spine
Piriformis muscle
Anterior sacral (pelvic) foramina
Sacroiliac joint
Anterior sacrococcygeal ligament
Sacrum
Sacral canal
Anorectal hiatus

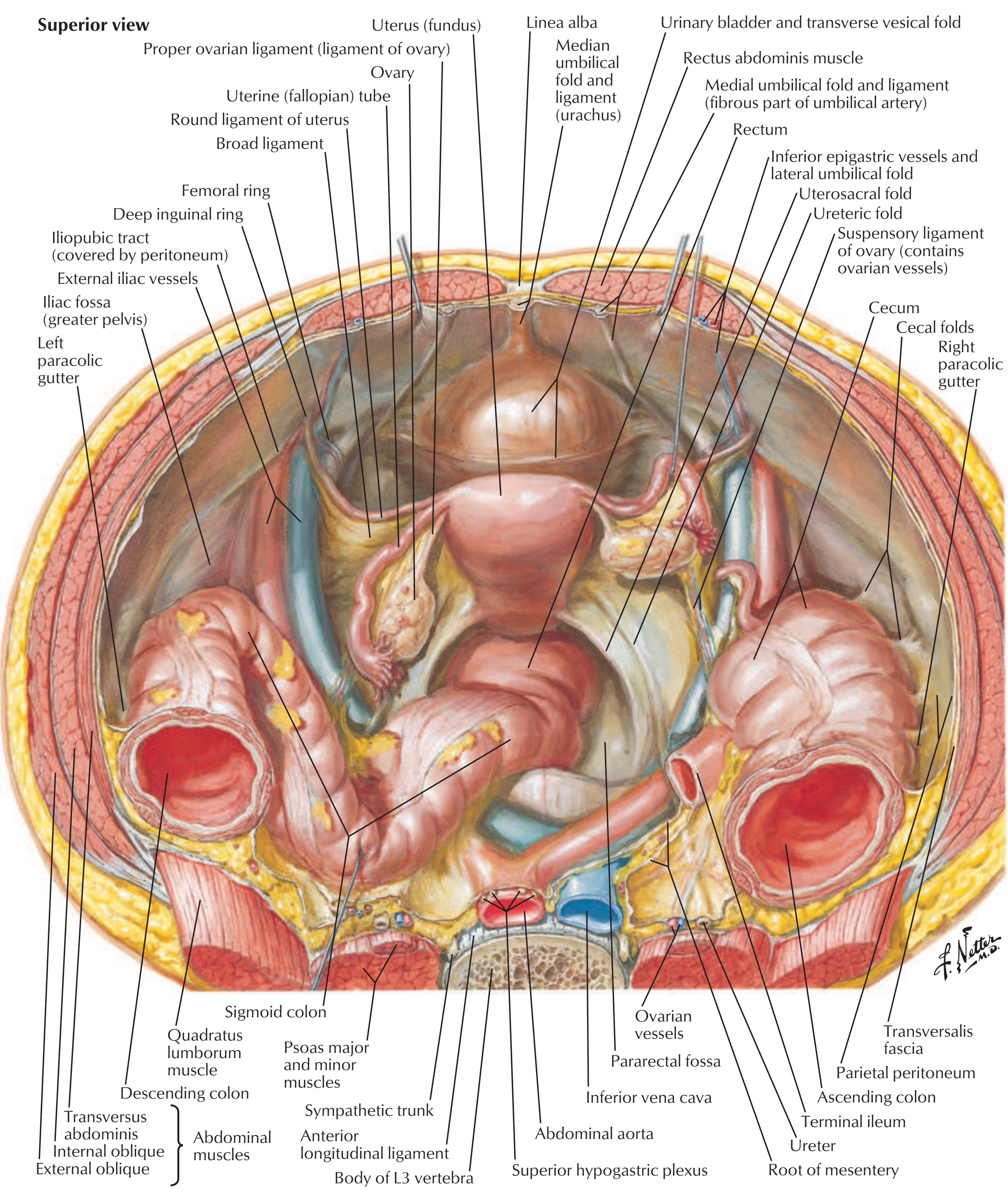
Pelvic Diaphragm: Male (continued)

For urogenital diaphragm see Plate 365

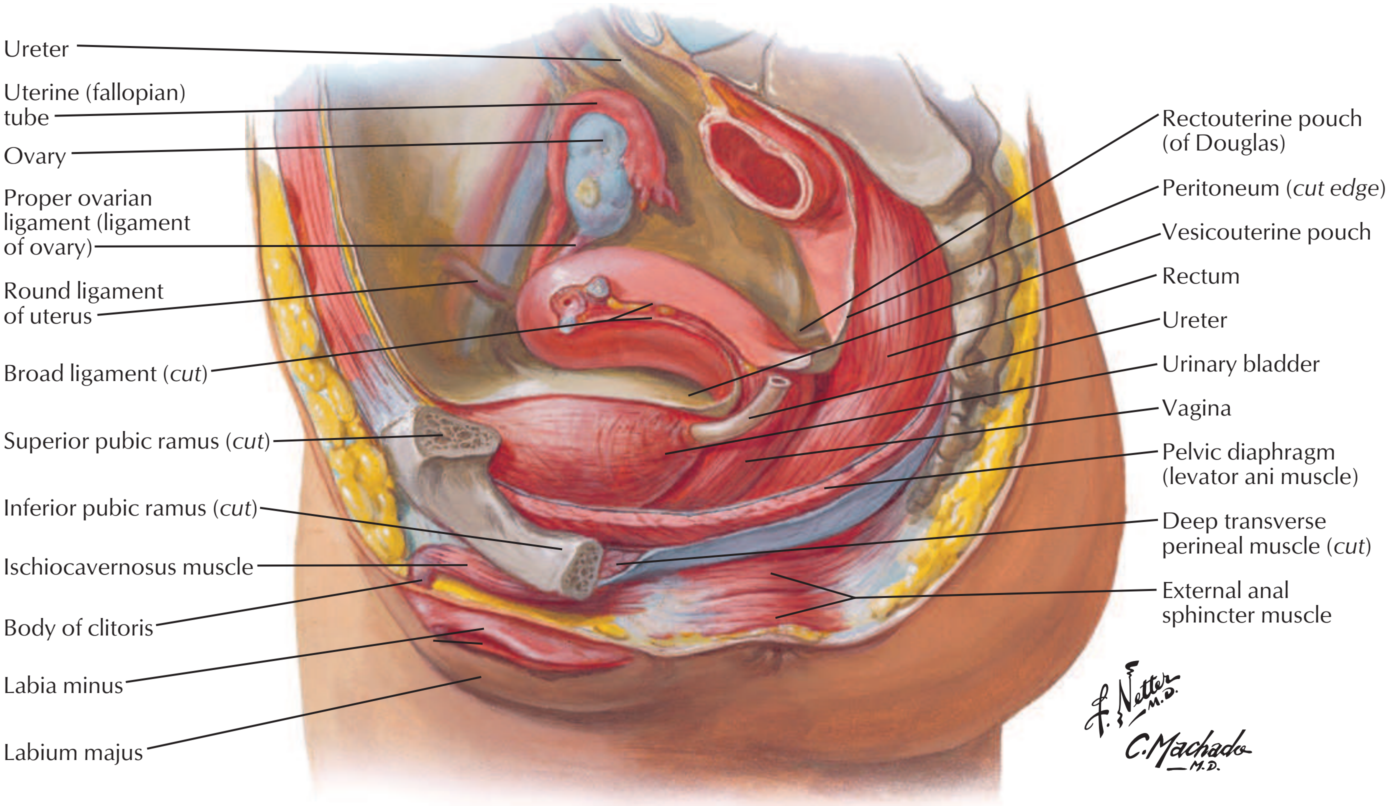
Inferior view


Deep dorsal veins of penis
Pubic symphysis
Fat in retropubic (prevesical) space
Inferior pubic (arcuate) ligament
Perineal body
Sphincter urethrae muscle ascending anterior aspect of prostate gland
Fibromuscular extensions of levator ani muscle to prostate gland
Urethra
Pubic tubercle
Rectoprostatic (Denonvilliers') fascia
Rectourethralis superior muscle
Medial border (pillar) of levator ani muscle
Prerectal muscle fibers (of Luschka) from levator ani muscle
Perineal membrane (*cut away*)
Muscle fibers from levator ani to conjoined longitudinal muscle of anal canal
Ischiopubic ramus
Obturator internus tendon
Ischial tuberosity
Sacrotuberous ligament (*cut*)
Sacrospinous ligament (*cut*)
Coccygeus muscle
Sacrospinous ligament (*cut*)
Sacrotuberous ligament (*cut*)
Tip of coccyx
Gluteus maximus muscle
Obturator internus muscle
Tendinous arch of levator ani muscle
Iliococcygeus
Pubococcygeus
Puboanalis (puborectalis)
Levator ani muscle
Circular muscle layer
Conjoined longitudinal muscle
of anorectal junction

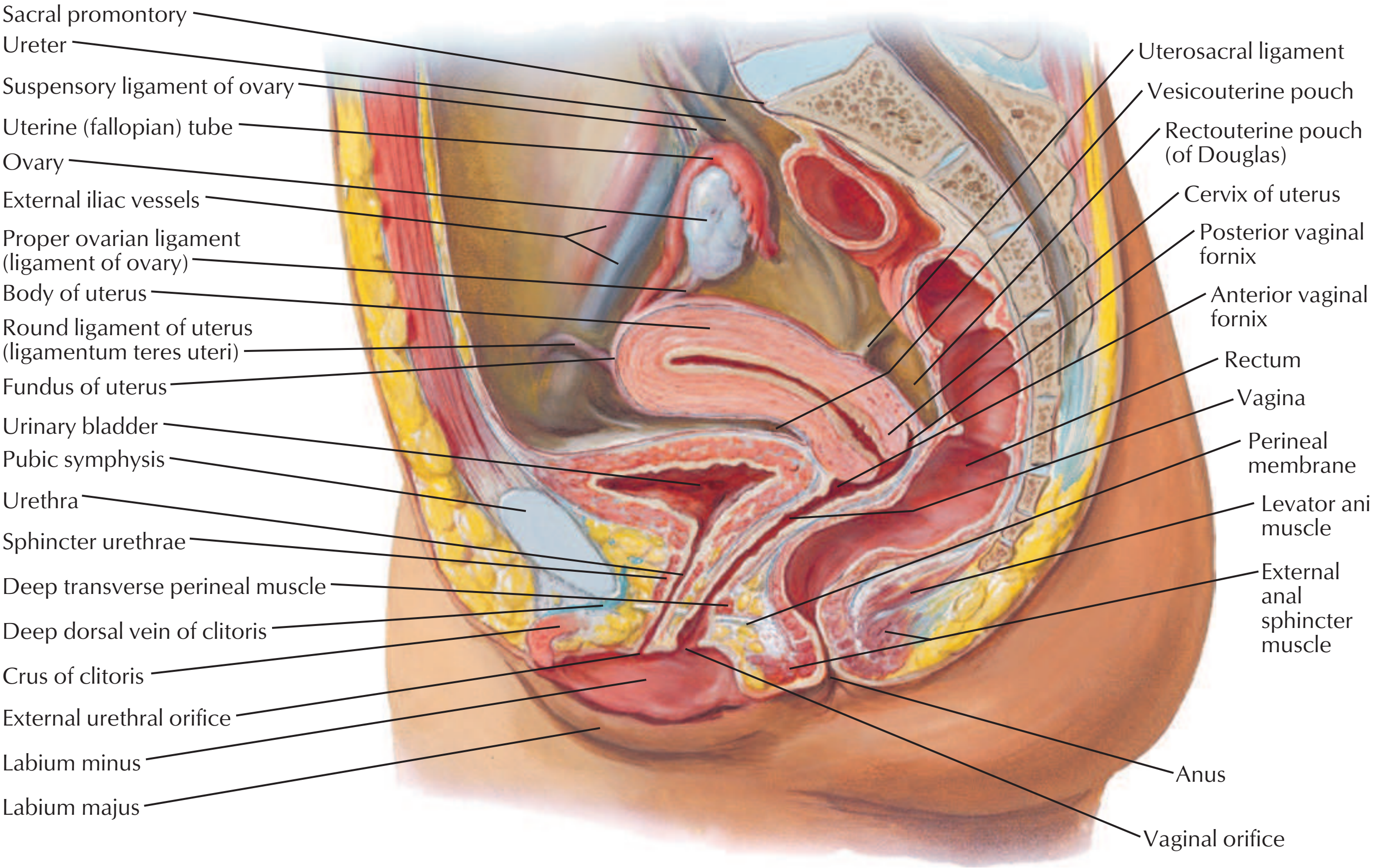
F. Netter M.D.
C. Machado M.D.


Superior view
Uterus (fundus)
Proper ovarian ligament (ligament of ovary)
Ovary
Uterine (fallopian) tube
Round ligament of uterus
Broad ligament
Femoral ring
Deep inguinal ring
Iliopubic tract (covered by peritoneum)
External iliac vessels
Iliac fossa (greater pelvis)
Left paracolic gutter
Linea alba
Median umbilical fold and ligament (urachus)
Urinary bladder and transverse vesical fold
Rectus abdominis muscle
Medial umbilical fold and ligament (fibrous part of umbilical artery)
Rectum
Inferior epigastric vessels and lateral umbilical fold
Uterosacral fold
Ureteric fold
Suspensory ligament of ovary (contains ovarian vessels)
Cecum
Cecal folds
Right paracolic gutter
Sigmoid colon
Quadratus lumborum muscle
Psoas major and minor muscles
Descending colon
Transversus abdominis
Internal oblique
External oblique
Abdominal muscles
Sympathetic trunk
Anterior longitudinal ligament
Body of L3 vertebra
Ovarian vessels
Pararectal fossa
Inferior vena cava
Abdominal aorta
Superior hypogastric plexus
Transversalis fascia
Parietal peritoneum
Ascending colon
Terminal ileum
Ureter
Root of mesentery

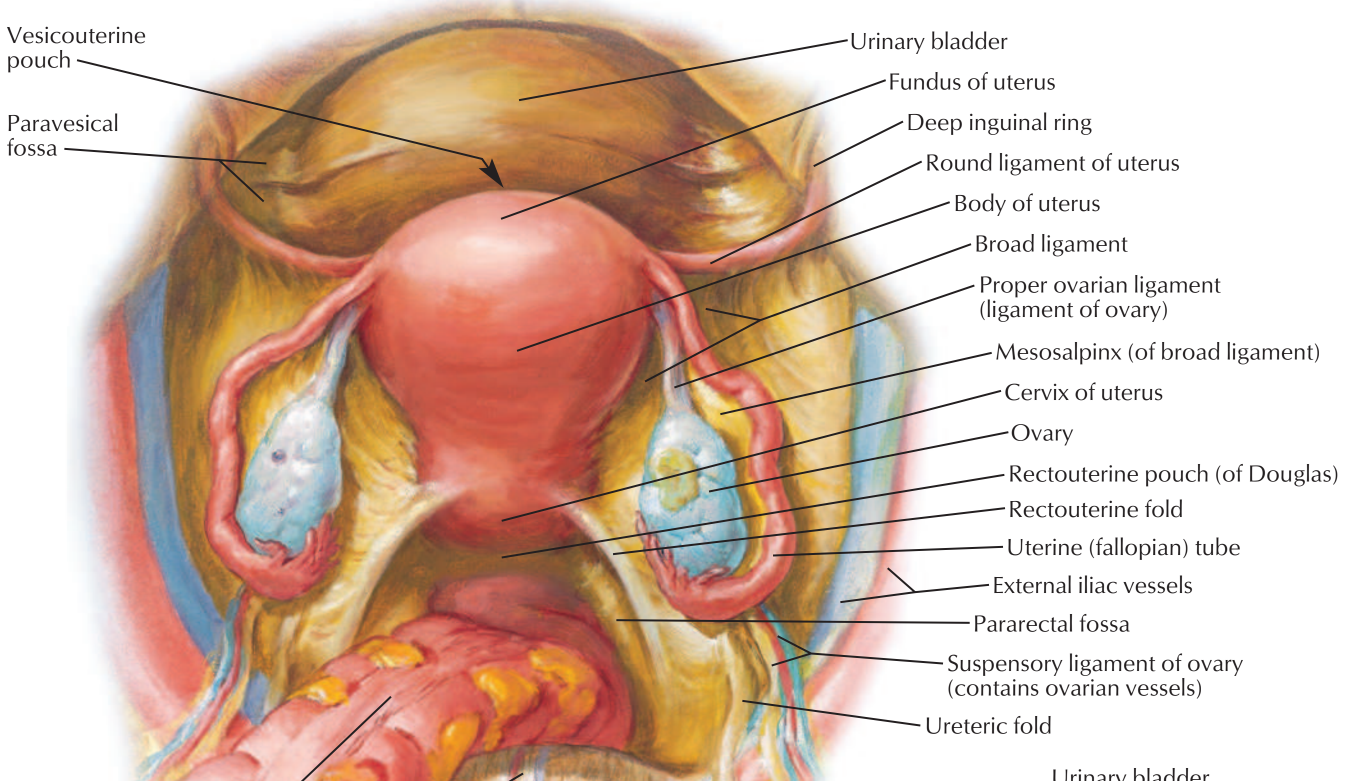
Paramedian (sagittal) dissection

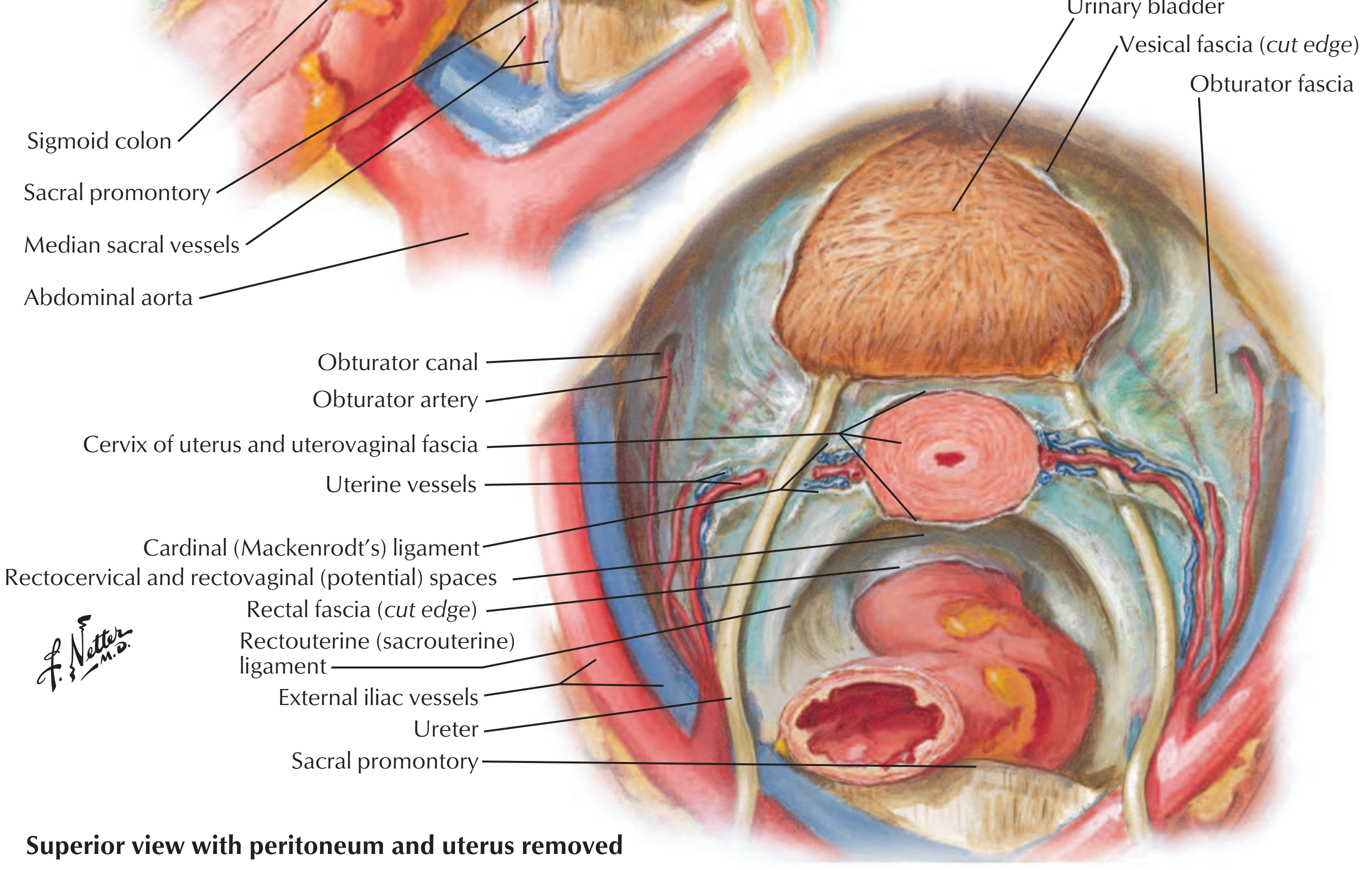

Ureter
Uterine (fallopian) tube
Ovary
Proper ovarian ligament (ligament of ovary)
Round ligament of uterus
Broad ligament (*cut*)
Superior pubic ramus (*cut*)
Inferior pubic ramus (*cut*)
Ischiocavernosus muscle
Body of clitoris
Labia minus
Labium majus
Rectouterine pouch (of Douglas)
Peritoneum (*cut edge*)
Vesicouterine pouch
Rectum
Ureter
Urinary bladder
Vagina
Pelvic diaphragm (levator ani muscle)
Deep transverse perineal muscle (*cut*)
External anal sphincter muscle
F. Netter M.D.
C. Machado M.D.

Median (sagittal) section


Sacral promontory
Ureter
Suspensory ligament of ovary
Uterine (fallopian) tube
Ovary
External iliac vessels
Proper ovarian ligament (ligament of ovary)
Body of uterus
Round ligament of uterus (ligamentum teres uteri)
Fundus of uterus
Urinary bladder
Pubic symphysis
Urethra
Sphincter urethrae
Deep transverse perineal muscle
Deep dorsal vein of clitoris
Crus of clitoris
External urethral orifice
Labium minus
Labium majus
Uterosacral ligament
Vesicouterine pouch
Rectouterine pouch (of Douglas)
Cervix of uterus
Posterior vaginal fornix
Anterior vaginal fornix
Rectum
Vagina
Perineal membrane
Levator ani muscle
External anal sphincter muscle
Anus
Vaginal orifice

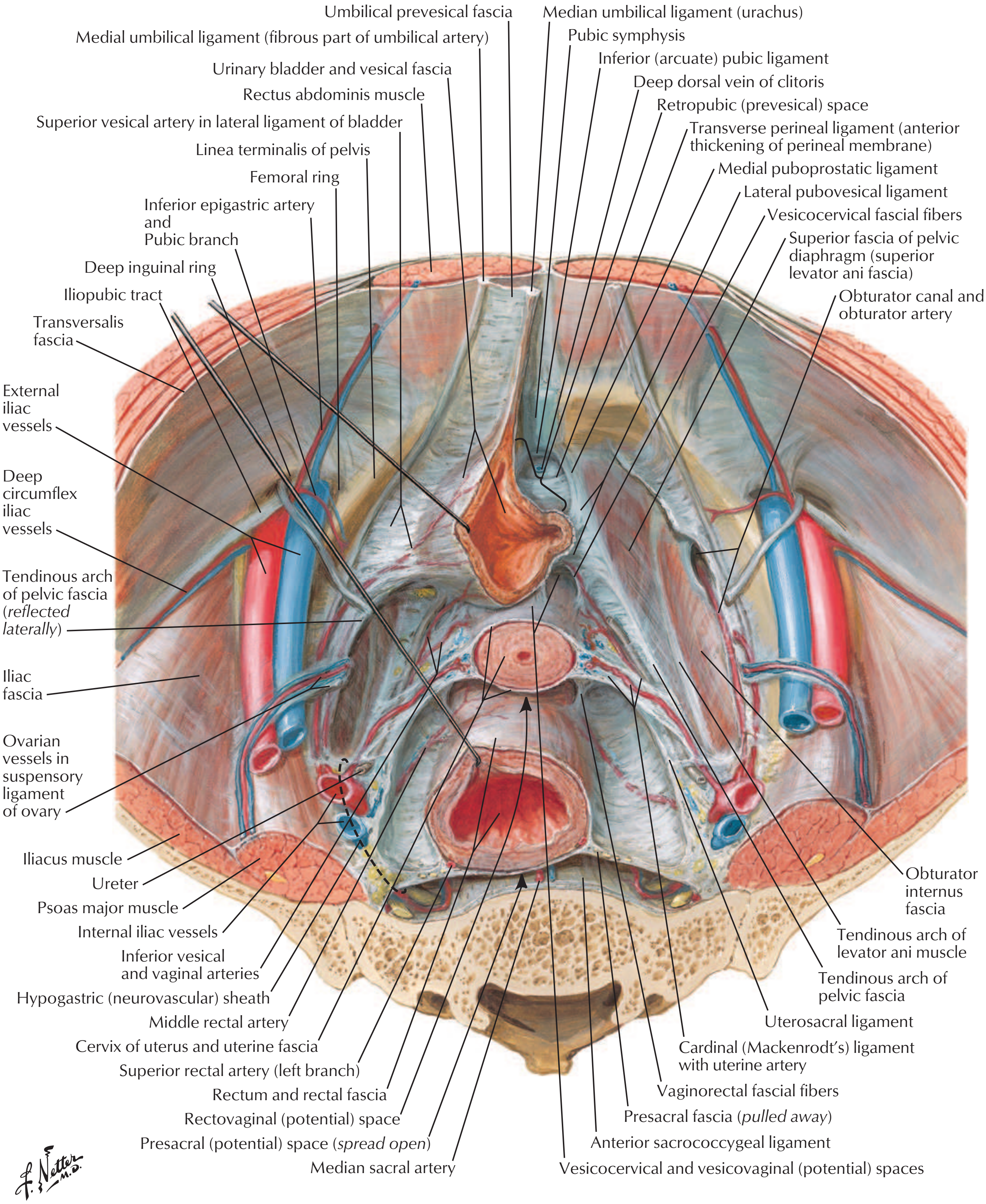
Superior view with peritoneum intact


Vesicouterine pouch
Paravesical fossa
Urinary bladder
Fundus of uterus
Deep inguinal ring
Round ligament of uterus
Body of uterus
Broad ligament
Proper ovarian ligament (ligament of ovary)
Mesosalpinx (of broad ligament)
Cervix of uterus
Ovary
Rectouterine pouch (of Douglas)
Rectouterine fold
Uterine (fallopian) tube
External iliac vessels
Pararectal fossa
Suspensory ligament of ovary (contains ovarian vessels)
Ureteric fold
Sigmoid colon
Sacral promontory
Median sacral vessels
Abdominal aorta

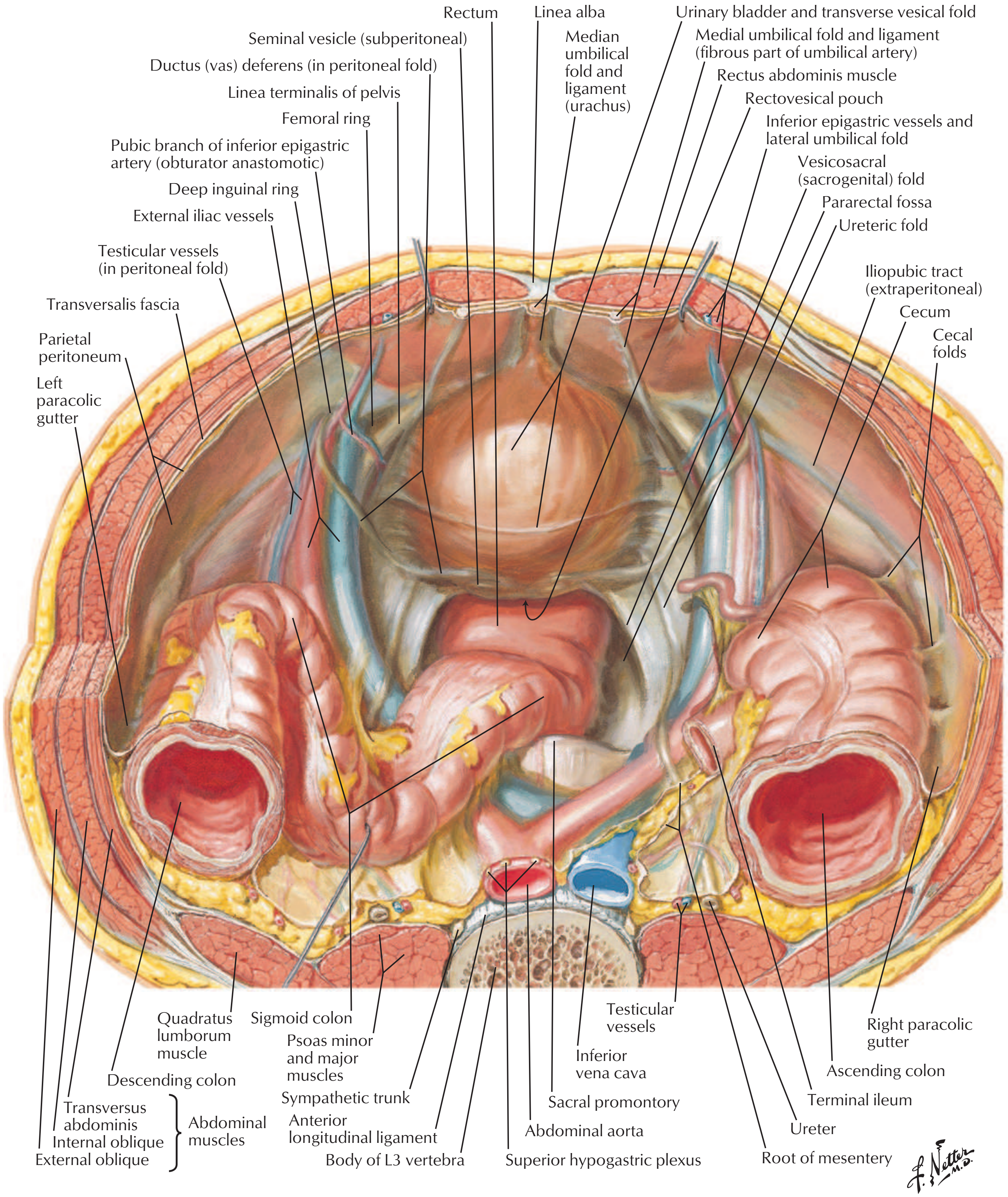

Urinary bladder
Vesical fascia (*cut edge*)
Obturator fascia
Obturator canal
Obturator artery
Cervix of uterus and uterovaginal fascia
Uterine vessels
Cardinal (Mackenrodt's) ligament
Rectocervical and rectovaginal (potential) spaces
Rectal fascia (*cut edge*)
Rectouterine (sacrouterine) ligament
External iliac vessels
Ureter
Sacral promontory
F. Netter M.D.

Superior view with peritoneum and uterus removed

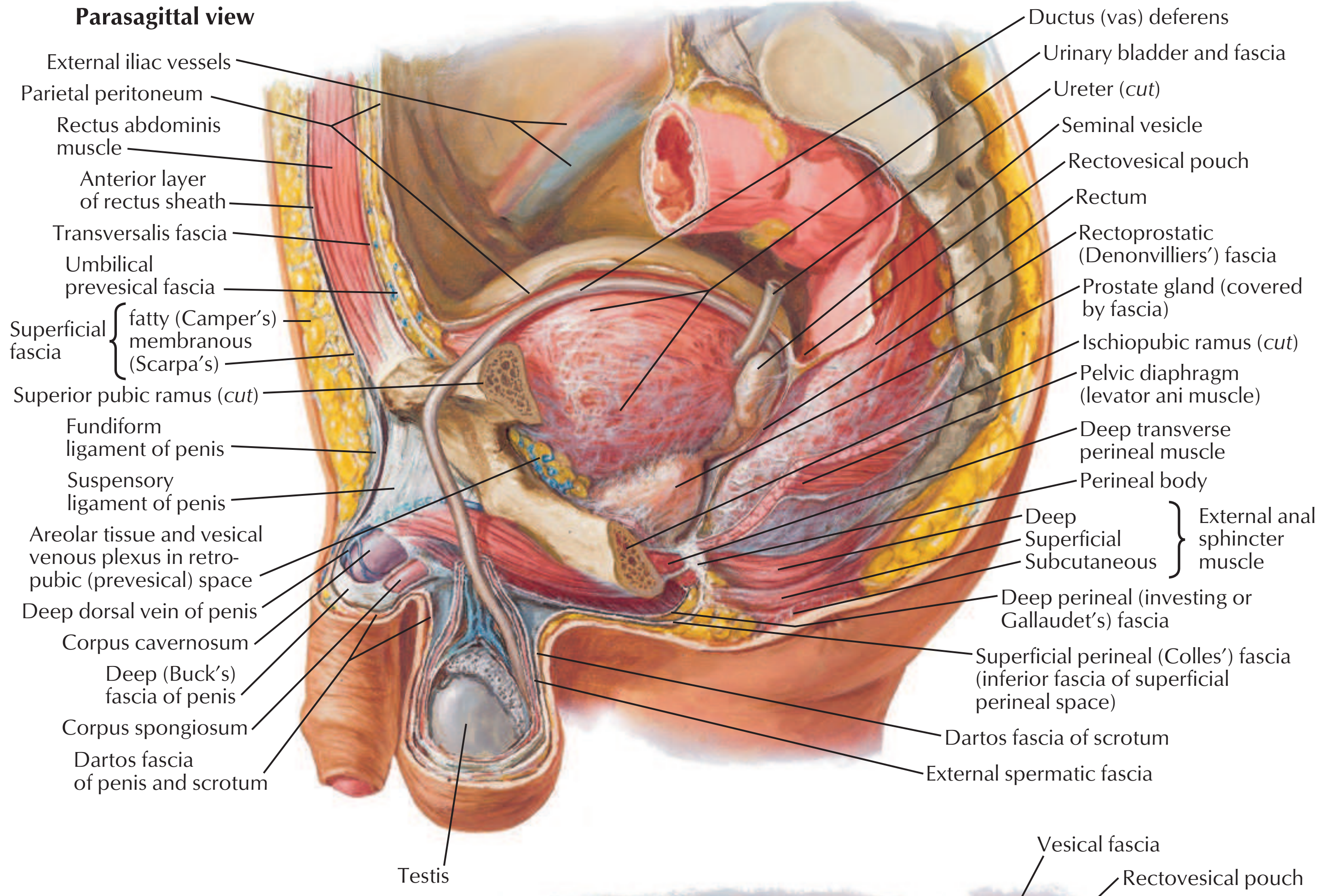
Female: superior view (peritoneum and loose areolar tissue removed)


Umbilical prevesical fascia
Medial umbilical ligament (fibrous part of umbilical artery)
Urinary bladder and vesical fascia
Rectus abdominis muscle
Superior vesical artery in lateral ligament of bladder
Linea terminalis of pelvis
Femoral ring
Inferior epigastric artery and Pubic branch
Deep inguinal ring
Iliopubic tract
Transversalis fascia
External iliac vessels
Deep circumflex iliac vessels
Tendinous arch of pelvic fascia (*reflected laterally*)
Iliac fascia
Ovarian vessels in suspensory ligament of ovary
Iliacus muscle
Ureter
Psoas major muscle
Internal iliac vessels
Inferior vesical and vaginal arteries
Hypogastric (neurovascular) sheath
Middle rectal artery
Cervix of uterus and uterine fascia
Superior rectal artery (left branch)
Rectum and rectal fascia
Rectovaginal (potential) space
Presacral (potential) space (*spread open*)
Median sacral artery
Median umbilical ligament (urachus)
Pubic symphysis
Inferior (arcuate) pubic ligament
Deep dorsal vein of clitoris
Retropubic (prevesical) space
Transverse perineal ligament (anterior thickening of perineal membrane)
Medial puboprostatic ligament
Lateral pubovesical ligament
Vesicocervical fascial fibers
Superior fascia of pelvic diaphragm (superior levator ani fascia)
Obturator canal and obturator artery
Obturator internus fascia
Tendinous arch of levator ani muscle
Tendinous arch of pelvic fascia
Uterosacral ligament
Cardinal (Mackenrodt's) ligament with uterine artery
Vaginorectal fascial fibers
Presacral fascia (*pulled away*)
Anterior sacrococcygeal ligament
Vesicocervical and vesicovaginal (potential) spaces
F. Netter M.D.

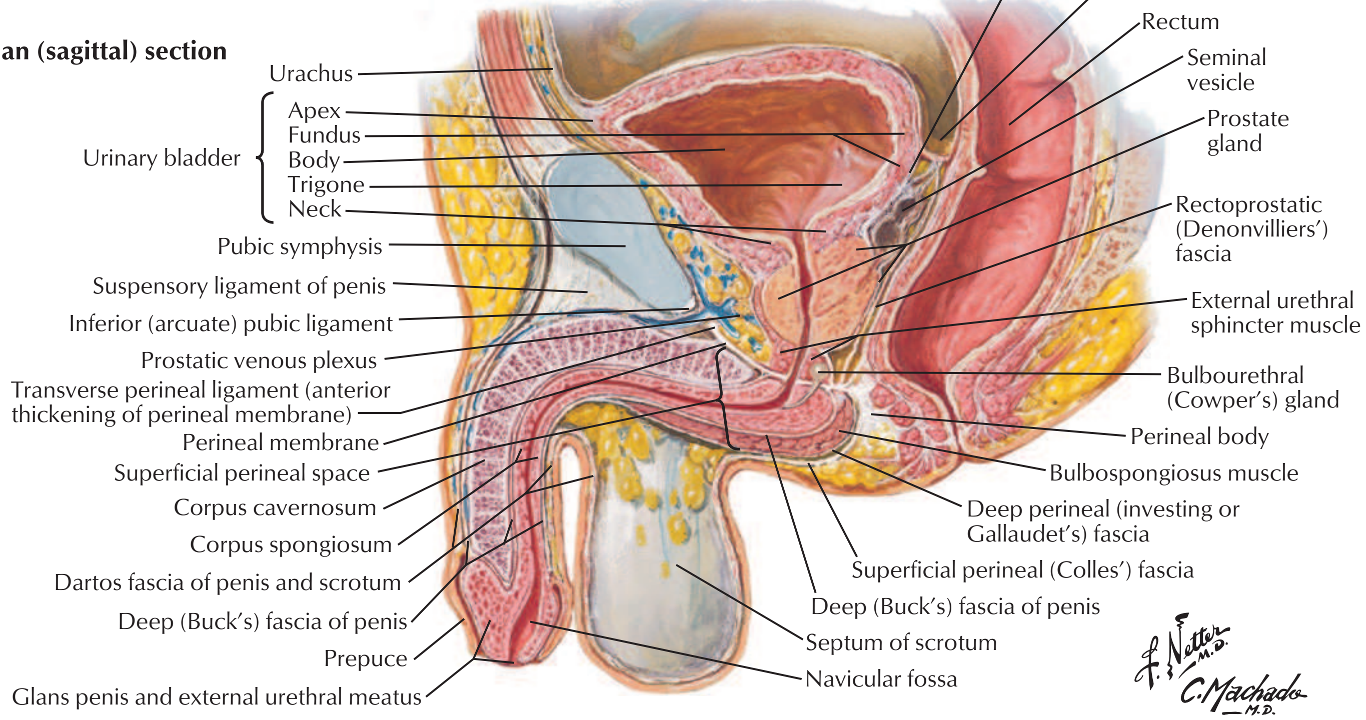
Superior view


Rectum
Linea alba
Urinary bladder and transverse vesical fold
Seminal vesicle (subperitoneal)
Median umbilical fold and ligament (urachus)
Medial umbilical fold and ligament (fibrous part of umbilical artery)
Ductus (vas) deferens (in peritoneal fold)
Rectus abdominis muscle
Linea terminalis of pelvis
Rectovesical pouch
Femoral ring
Inferior epigastric vessels and lateral umbilical fold
Pubic branch of inferior epigastric artery (obturator anastomotic)
Vesicosacral (sacrogenital) fold
Deep inguinal ring
Pararectal fossa
External iliac vessels
Ureteric fold
Testicular vessels (in peritoneal fold)
Iliopubic tract (extraperitoneal)
Transversalis fascia
Cecum
Parietal peritoneum
Cecal folds
Left paracolic gutter
Quadratus lumborum muscle
Sigmoid colon
Psoas minor and major muscles
Testicular vessels
Right paracolic gutter
Inferior vena cava
Descending colon
Ascending colon
Sympathetic trunk
Sacral promontory
Transversus abdominis
Internal oblique
External oblique
Abdominal muscles
Anterior longitudinal ligament
Terminal ileum
Abdominal aorta
Ureter
Body of L3 vertebra
Superior hypogastric plexus
Root of mesentery

Parasagittal view

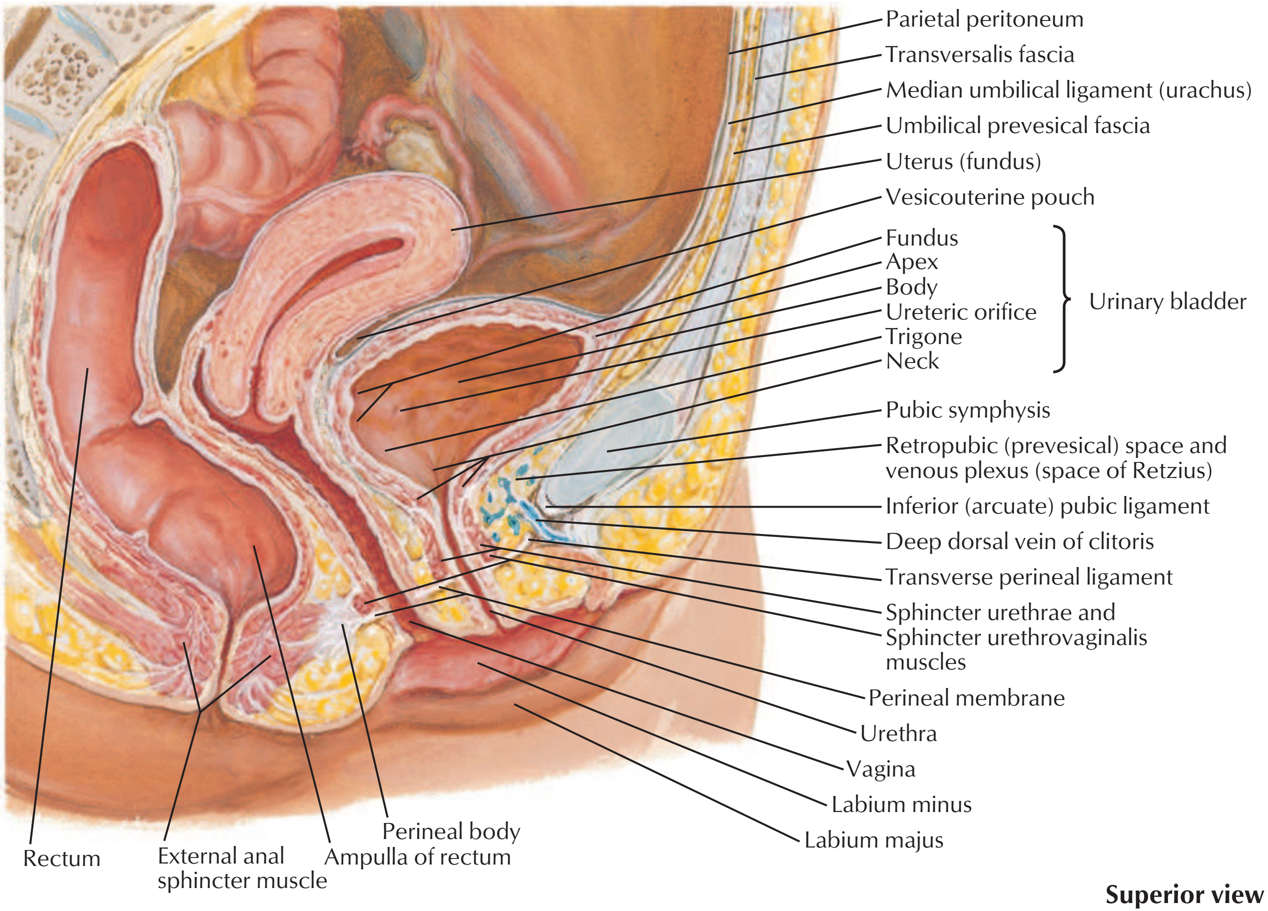

External iliac vessels
Parietal peritoneum
Rectus abdominis muscle
Anterior layer of rectus sheath
Transversalis fascia
Umbilical prevesical fascia
Superficial fascia
fatty (Camper's)
membranous (Scarpa's)
Superior pubic ramus (*cut*)
Fundiform ligament of penis
Suspensory ligament of penis
Areolar tissue and vesical venous plexus in retropubic (prevesical) space
Deep dorsal vein of penis
Corpus cavernosum
Deep (Buck's) fascia of penis
Corpus spongiosum
Dartos fascia of penis and scrotum
Testis
Ductus (vas) deferens
Urinary bladder and fascia
Ureter (*cut*)
Seminal vesicle
Rectovesical pouch
Rectum
Rectoprostatic (Denonvilliers') fascia
Prostate gland (covered by fascia)
Ischiopubic ramus (*cut*)
Pelvic diaphragm (levator ani muscle)
Deep transverse perineal muscle
Perineal body
Deep
Superficial
Subcutaneous
External anal sphincter muscle
Deep perineal (investing or Gallaudet's) fascia
Superficial perineal (Colles') fascia (inferior fascia of superficial perineal space)
Dartos fascia of scrotum
External spermatic fascia

Median (sagittal) section

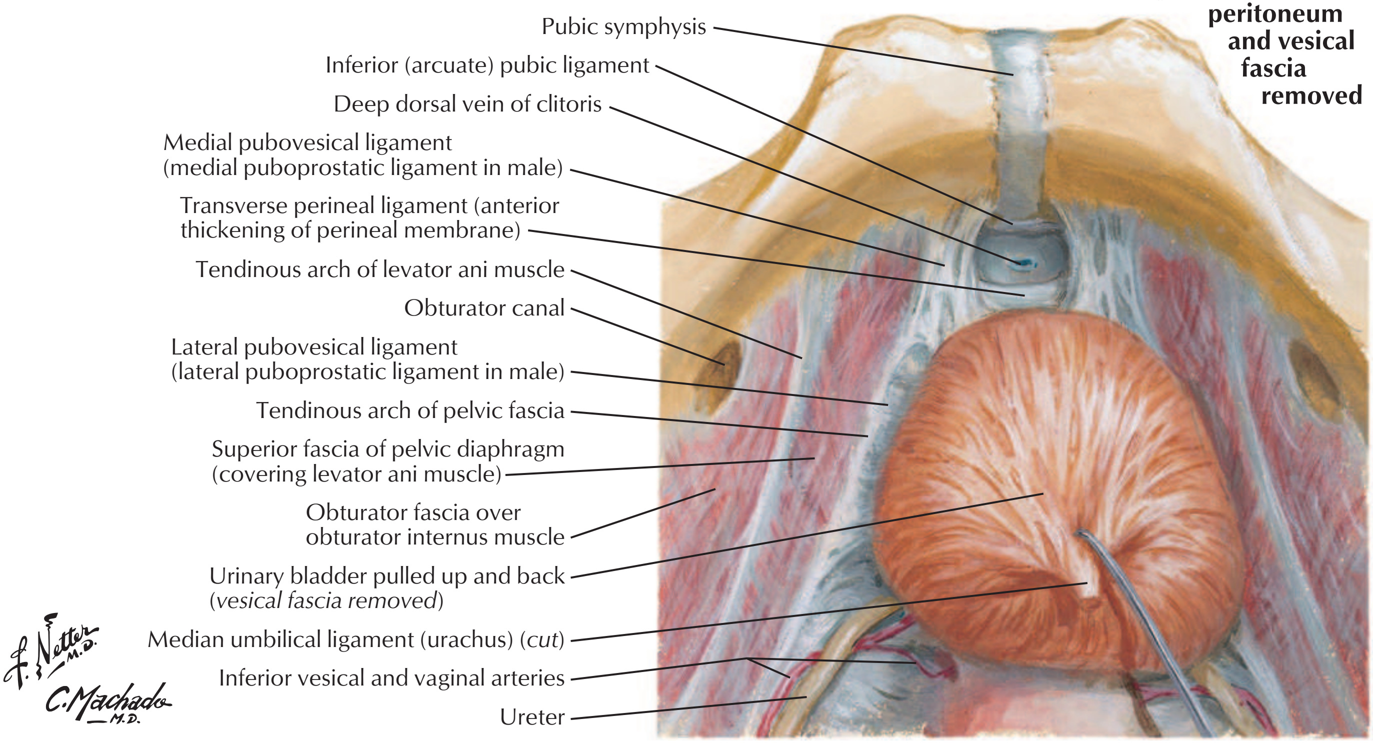

Urachus
Urinary bladder
Apex
Fundus
Body
Trigone
Neck
Pubic symphysis
Suspensory ligament of penis
Inferior (arcuate) pubic ligament
Prostatic venous plexus
Transverse perineal ligament (anterior thickening of perineal membrane)
Perineal membrane
Superficial perineal space
Corpus cavernosum
Corpus spongiosum
Dartos fascia of penis and scrotum
Deep (Buck's) fascia of penis
Prepuce
Glans penis and external urethral meatus
Vesical fascia
Rectovesical pouch
Rectum
Seminal vesicle
Prostate gland
Rectoprostatic (Denonvilliers') fascia
External urethral sphincter muscle
Bulbourethral (Cowper's) gland
Perineal body
Bulbospongiosus muscle
Deep perineal (investing or Gallaudet's) fascia
Superficial perineal (Colles') fascia
Deep (Buck's) fascia of penis
Septum of scrotum
Navicular fossa
F. Netter M.D.
C. Machado M.D.

Urinary Bladder: Orientation and Supports

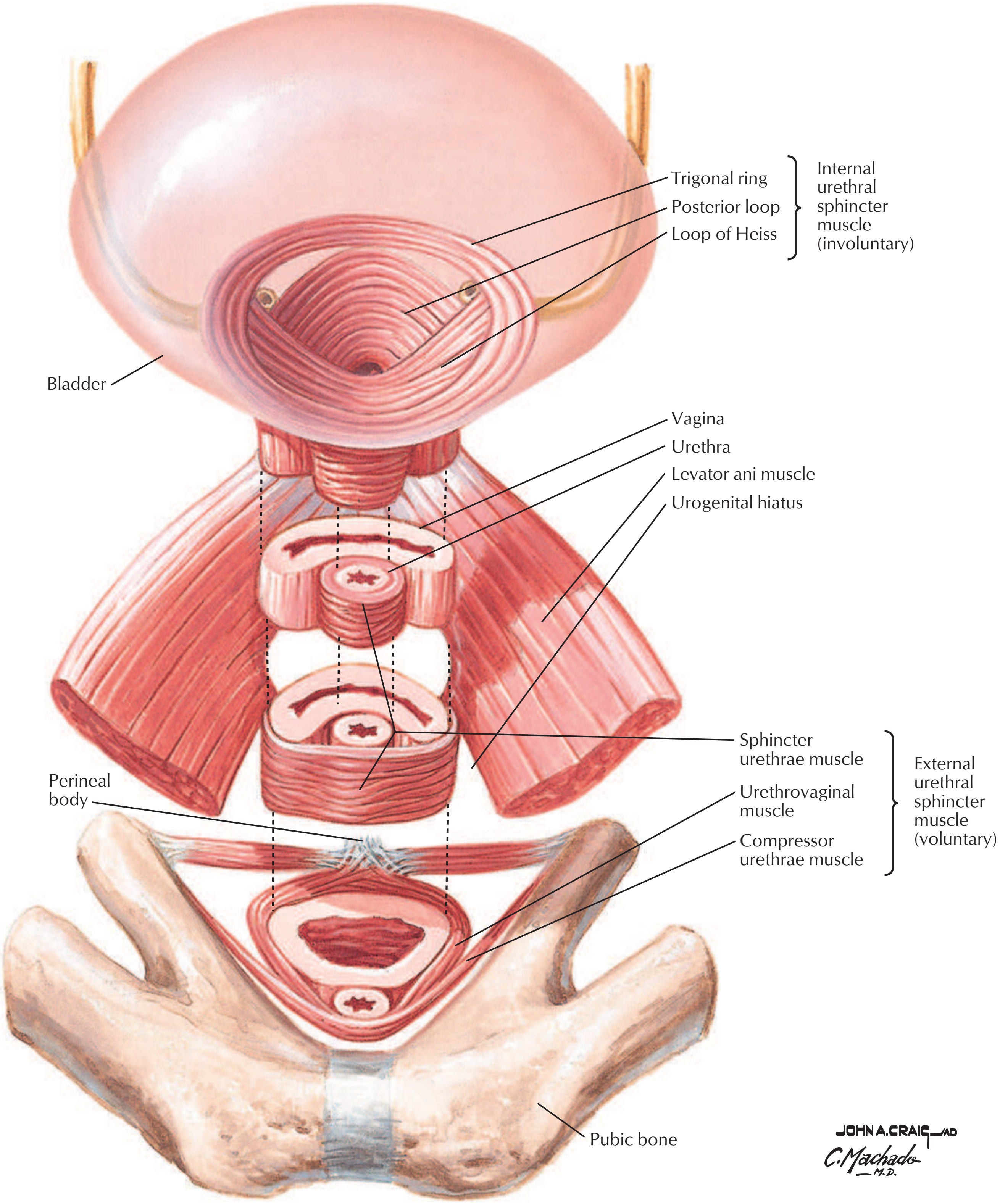
Female: midsagittal section


Parietal peritoneum
Transversalis fascia
Median umbilical ligament (urachus)
Umbilical prevesical fascia
Uterus (fundus)
Vesicouterine pouch
Fundus
Apex
Body
Ureteric orifice
Trigone
Neck
Urinary bladder
Pubic symphysis
Retropubic (prevesical) space and venous plexus (space of Retzius)
Inferior (arcuate) pubic ligament
Deep dorsal vein of clitoris
Transverse perineal ligament
Sphincter urethrae and Sphincter urethrovaginalis muscles
Perineal membrane
Urethra
Vagina
Labium minus
Labium majus
Perineal body
Ampulla of rectum
External anal sphincter muscle
Rectum

Superior view with peritoneum and vesical fascia removed

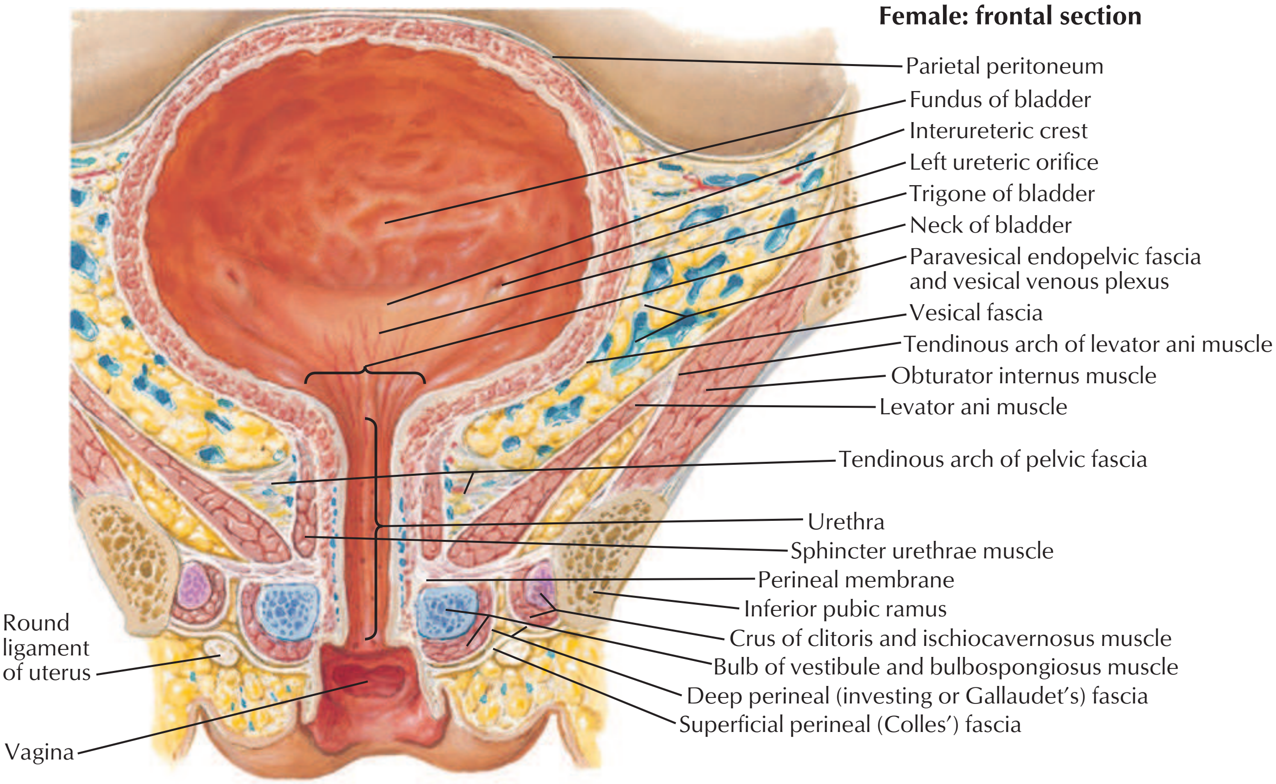

Pubic symphysis
Inferior (arcuate) pubic ligament
Deep dorsal vein of clitoris
Medial pubovesical ligament (medial puboprostatic ligament in male)
Transverse perineal ligament (anterior thickening of perineal membrane)
Tendinous arch of levator ani muscle
Obturator canal
Lateral pubovesical ligament (lateral puboprostatic ligament in male)
Tendinous arch of pelvic fascia
Superior fascia of pelvic diaphragm (covering levator ani muscle)
Obturator fascia over obturator internus muscle
Urinary bladder pulled up and back (*vesical fascia removed*)
Median umbilical ligament (urachus) (*cut*)
Inferior vesical and vaginal arteries
Ureter
F. Netter M.D.
C. Machado M.D.

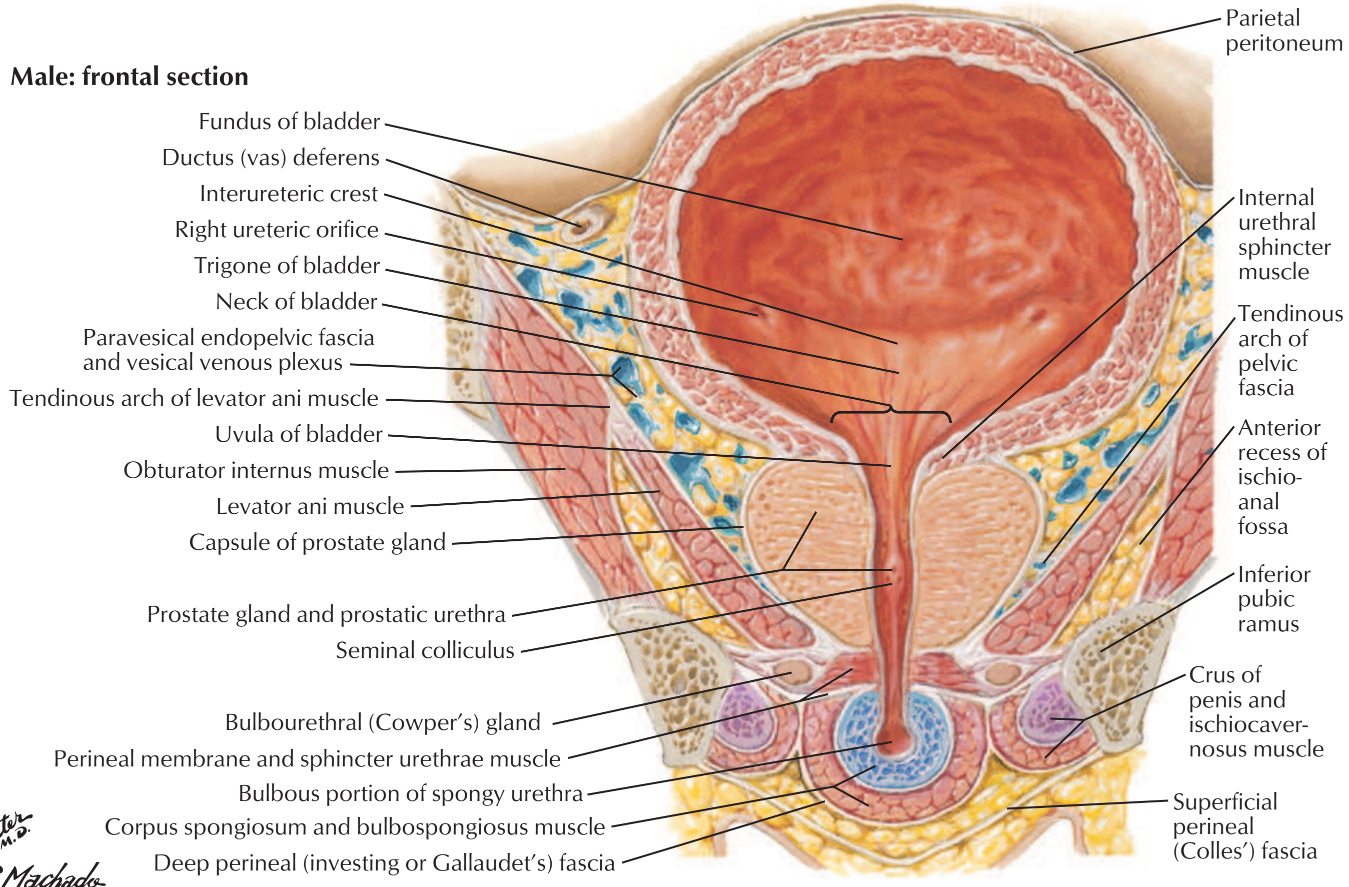
See also Plates 352, 360


Trigonal ring
Posterior loop
Loop of Heiss
Internal urethral sphincter muscle (involuntary)
Bladder
Vagina
Urethra
Levator ani muscle
Urogenital hiatus
Sphincter urethrae muscle
Urethrovaginal muscle
Compressor urethrae muscle
External urethral sphincter muscle (voluntary)
Perineal body
Pubic bone
JOHN A.CRAIG AD
C.Machado M.D.

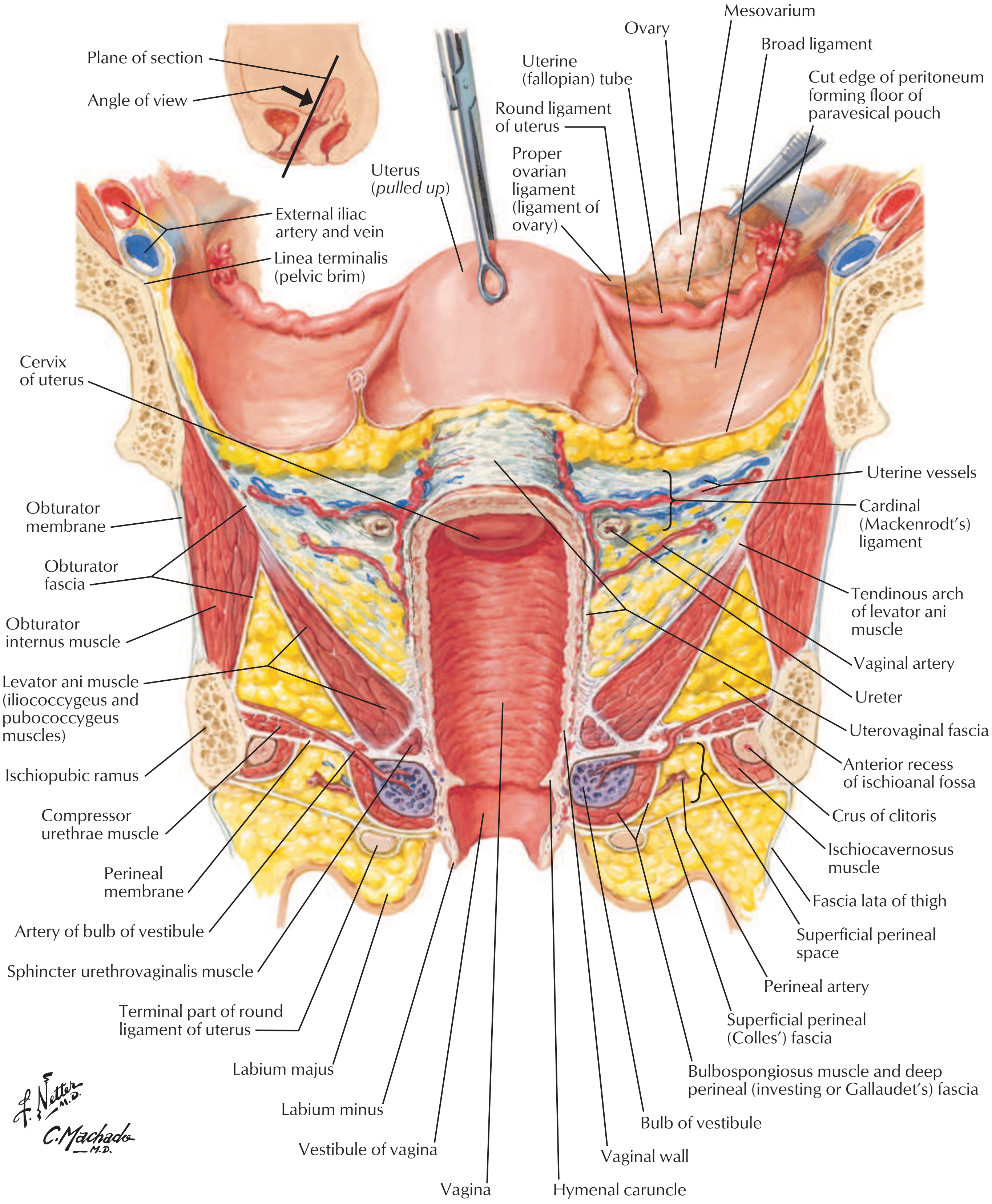
Urinary Bladder: Female and Male

See also Plates 345, 349, 385


Female: frontal section
Parietal peritoneum
Fundus of bladder
Interureteric crest
Left ureteric orifice
Trigone of bladder
Neck of bladder
Paravesical endopelvic fascia and vesical venous plexus
Vesical fascia
Tendinous arch of levator ani muscle
Obturator internus muscle
Levator ani muscle
Tendinous arch of pelvic fascia
Urethra
Sphincter urethrae muscle
Perineal membrane
Inferior pubic ramus
Crus of clitoris and ischiocavernosus muscle
Bulb of vestibule and bulbospongiosus muscle
Deep perineal (investing or Gallaudet's) fascia
Superficial perineal (Colles') fascia
Round ligament of uterus
Vagina


Male: frontal section
Parietal peritoneum
Fundus of bladder
Ductus (vas) deferens
Interureteric crest
Right ureteric orifice
Trigone of bladder
Neck of bladder
Paravesical endopelvic fascia and vesical venous plexus
Tendinous arch of levator ani muscle
Uvula of bladder
Obturator internus muscle
Levator ani muscle
Capsule of prostate gland
Prostate gland and prostatic urethra
Seminal colliculus
Bulbourethral (Cowper's) gland
Perineal membrane and sphincter urethrae muscle
Bulbous portion of spongy urethra
Corpus spongiosum and bulbospongiosus muscle
Deep perineal (investing or Gallaudet's) fascia
Internal urethral sphincter muscle
Tendinous arch of pelvic fascia
Anterior recess of ischio-anal fossa
Inferior pubic ramus
Crus of penis and ischiocavernosus muscle
Superficial perineal (Colles') fascia

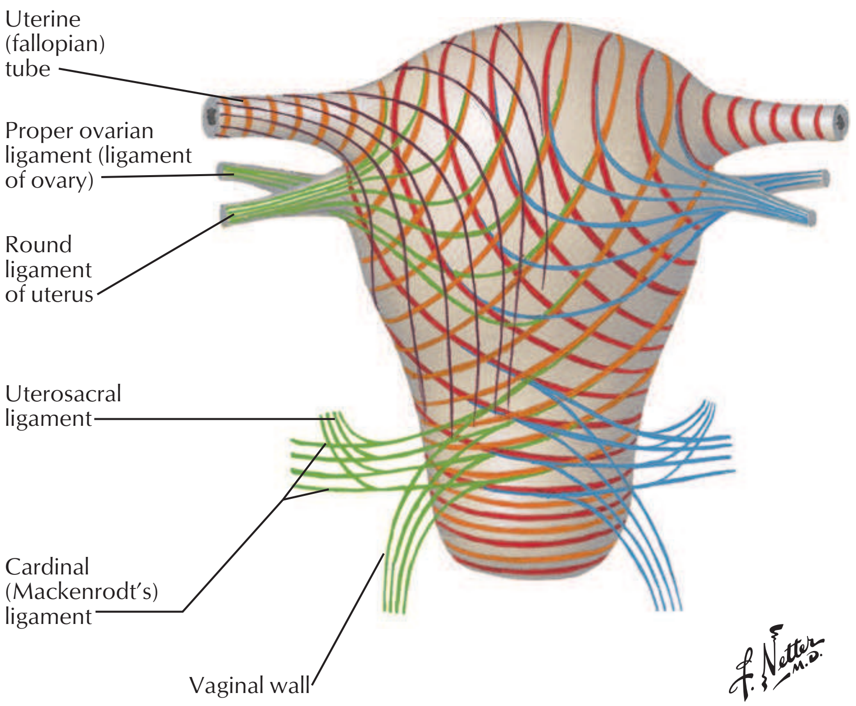
See also Plates 386, 388, 394


Plane of section
Angle of view
External iliac artery and vein
Linea terminalis (pelvic brim)
Uterus (*pulled up*)
Uterine (fallopian) tube
Round ligament of uterus
Proper ovarian ligament (ligament of ovary)
Ovary
Mesovarium
Broad ligament
Cut edge of peritoneum forming floor of paravesical pouch
Cervix of uterus
Obturator membrane
Obturator fascia
Obturator internus muscle
Levator ani muscle (iliococcygeus and pubococcygeus muscles)
Ischiopubic ramus
Compressor urethrae muscle
Perineal membrane
Artery of bulb of vestibule
Sphincter urethrovaginalis muscle
Terminal part of round ligament of uterus
Labium majus
Labium minus
Vestibule of vagina
Vagina
Hymenal caruncle
Vaginal wall
Bulb of vestibule
Bulbospongiosus muscle and deep perineal (investing or Gallaudet's) fascia
Superficial perineal (Colles') fascia
Perineal artery
Superficial perineal space
Fascia lata of thigh
Ischiocavernosus muscle
Crus of clitoris
Anterior recess of ischioanal fossa
Uterovaginal fascia
Ureter
Vaginal artery
Tendinous arch of levator ani muscle
Cardinal (Mackenrodt's) ligament
Uterine vessels

Uterus: Fascial Ligaments

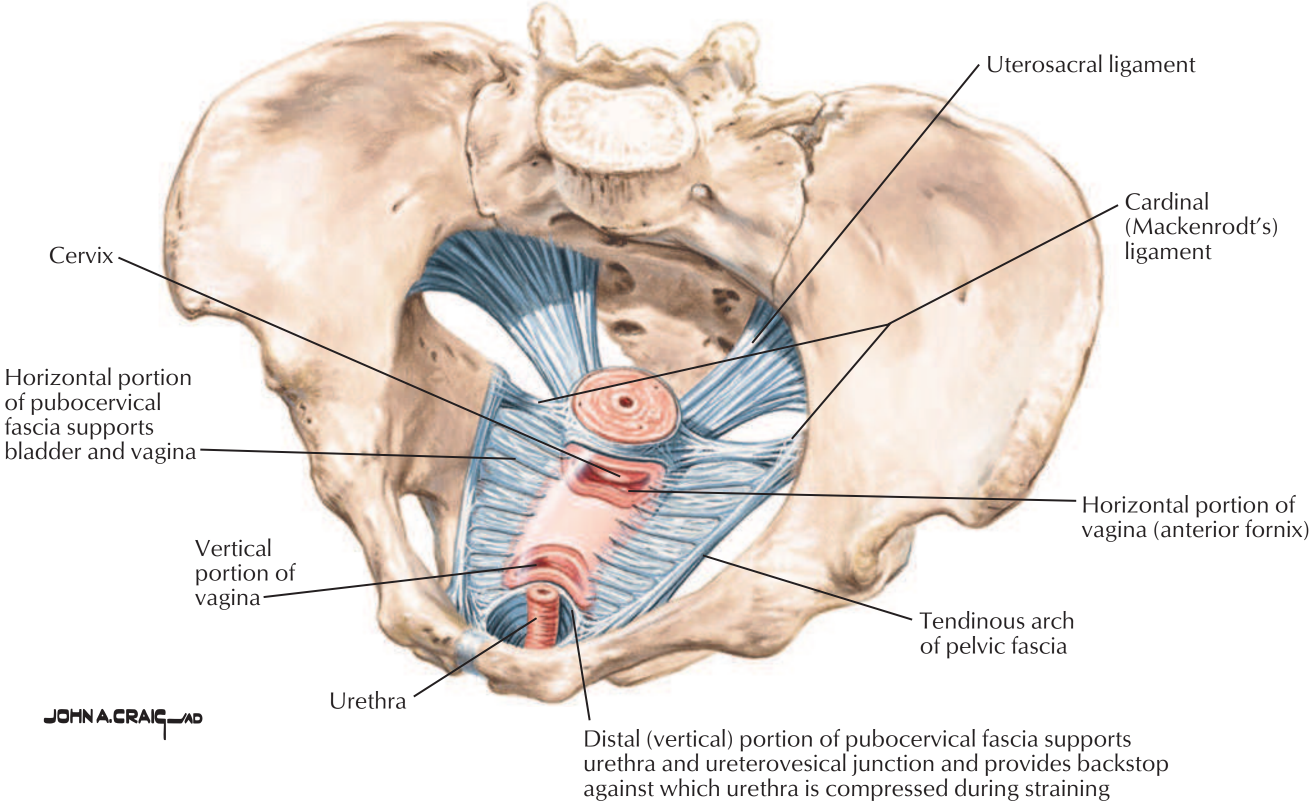
See also **Plate 347**

Fascial ligaments of uterus

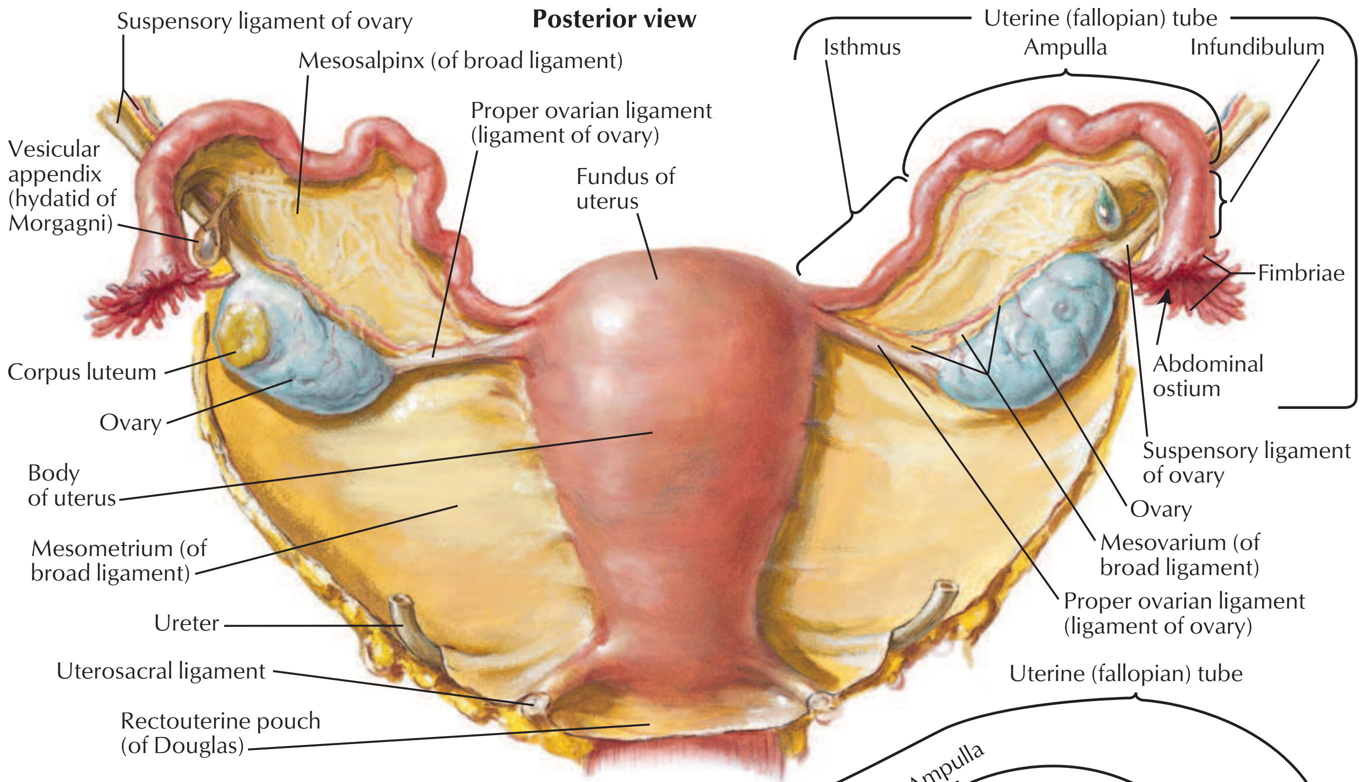


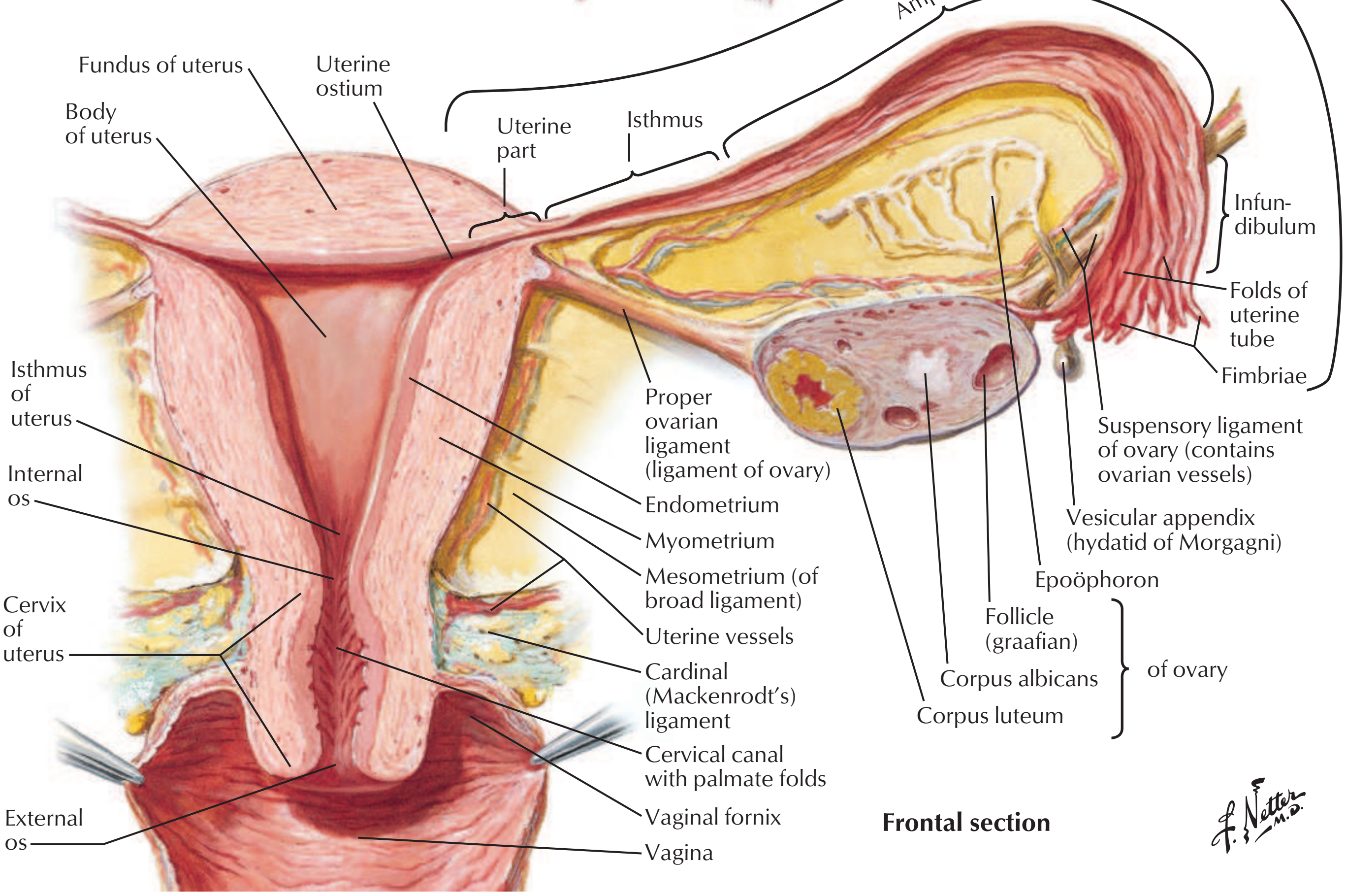
Uterine (fallopian) tube
Proper ovarian ligament (ligament of ovary)
Round ligament of uterus
Uterosacral ligament
Cardinal (Mackenrodt's) ligament
Vaginal wall

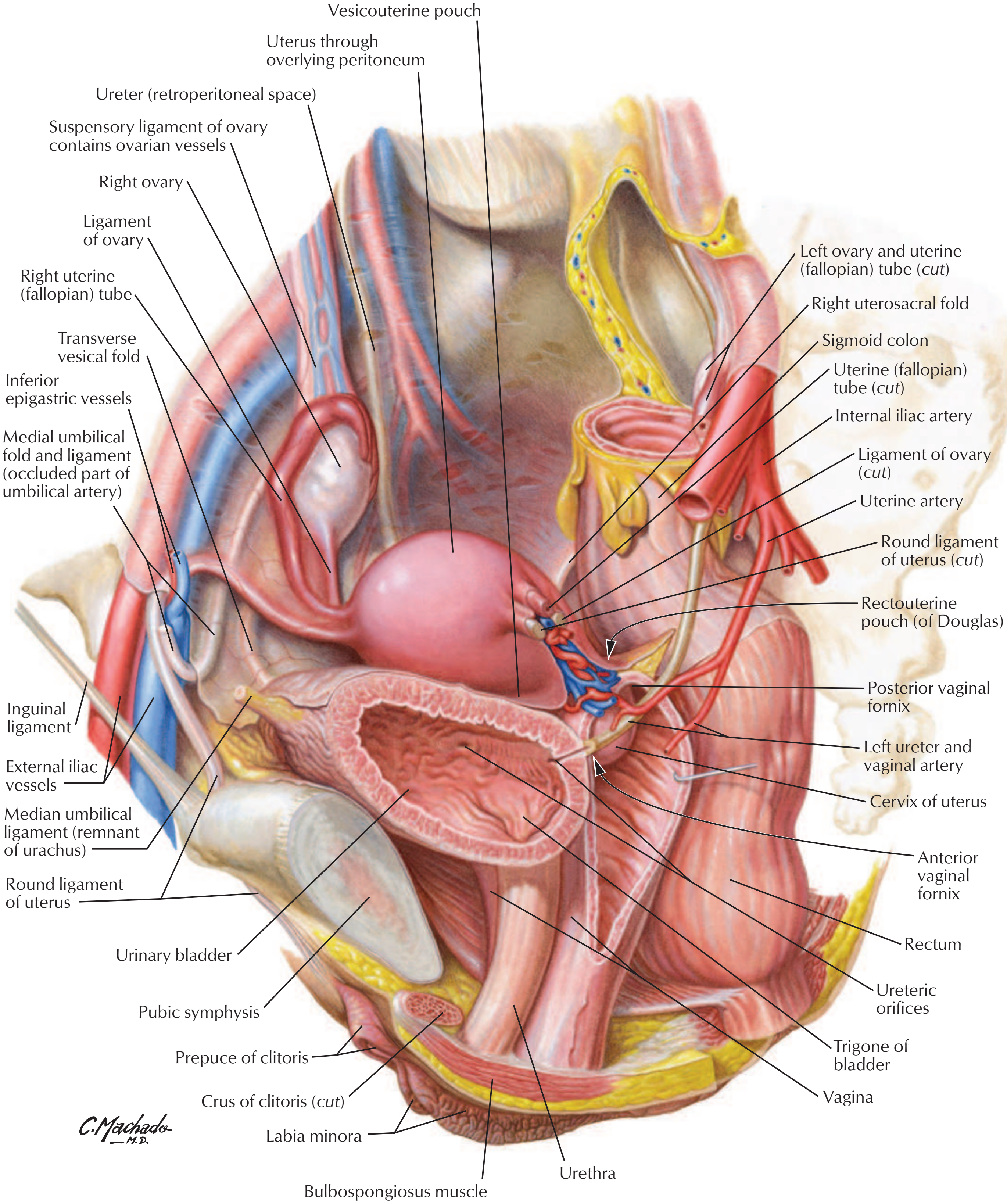
Pelvic fascia and ligaments



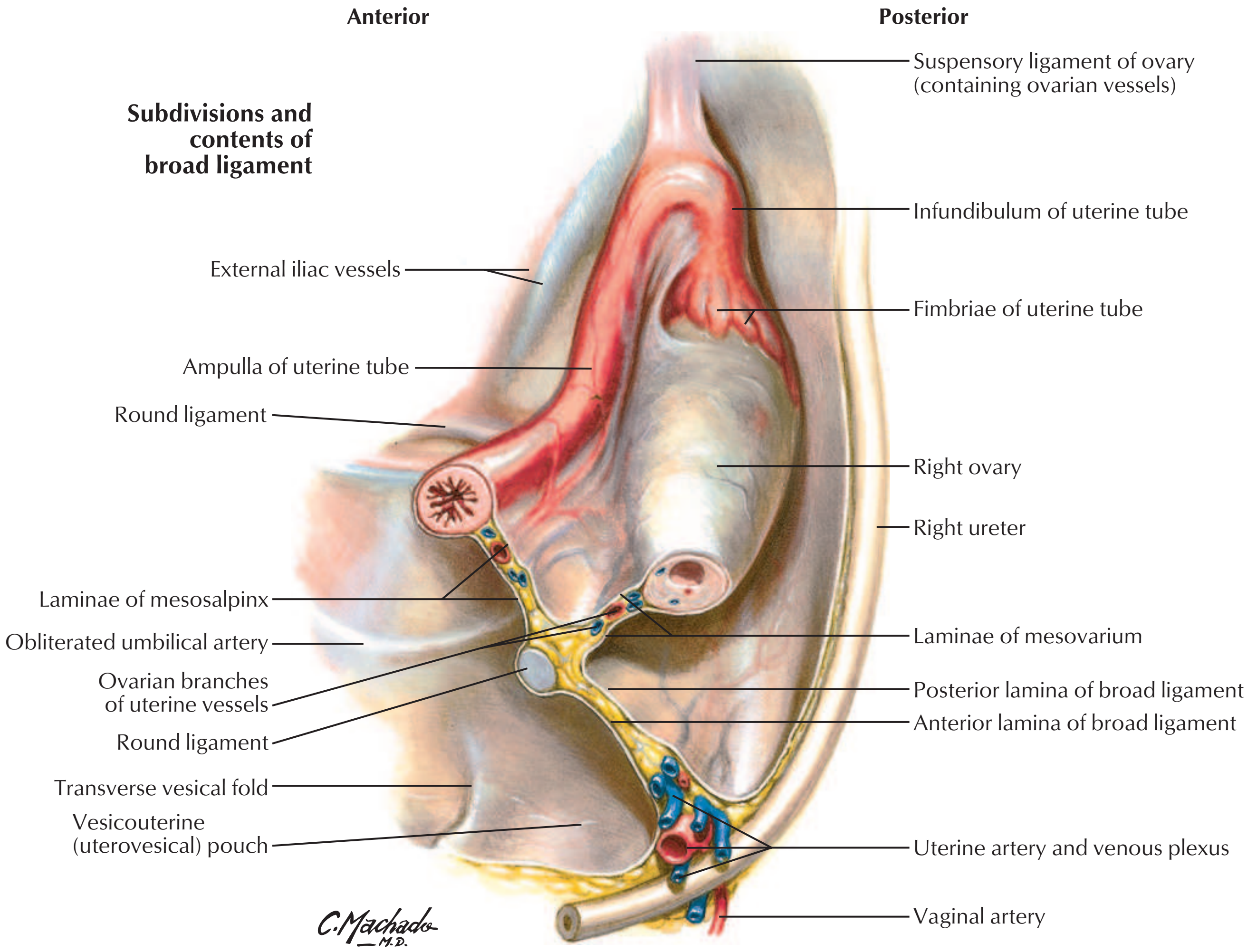
Uterosacral ligament
Cardinal (Mackenrodt's) ligament
Cervix
Horizontal portion of pubocervical fascia supports bladder and vagina
Horizontal portion of vagina (anterior fornix)
Vertical portion of vagina
Tendinous arch of pelvic fascia
Urethra
JOHN A.CRAIG_AD
Distal (vertical) portion of pubocervical fascia supports urethra and ureterovesical junction and provides backstop against which urethra is compressed during straining


Posterior view
Suspensory ligament of ovary
Mesosalpinx (of broad ligament)
Proper ovarian ligament (ligament of ovary)
Fundus of uterus
Vesicular appendix (hydatid of Morgagni)
Corpus luteum
Ovary
Body of uterus
Mesometrium (of broad ligament)
Ureter
Uterosacral ligament
Rectouterine pouch (of Douglas)
Uterine (fallopian) tube
Isthmus
Ampulla
Infundibulum
Fimbriae
Abdominal ostium
Suspensory ligament of ovary
Ovary
Mesovarium (of broad ligament)
Proper ovarian ligament (ligament of ovary)

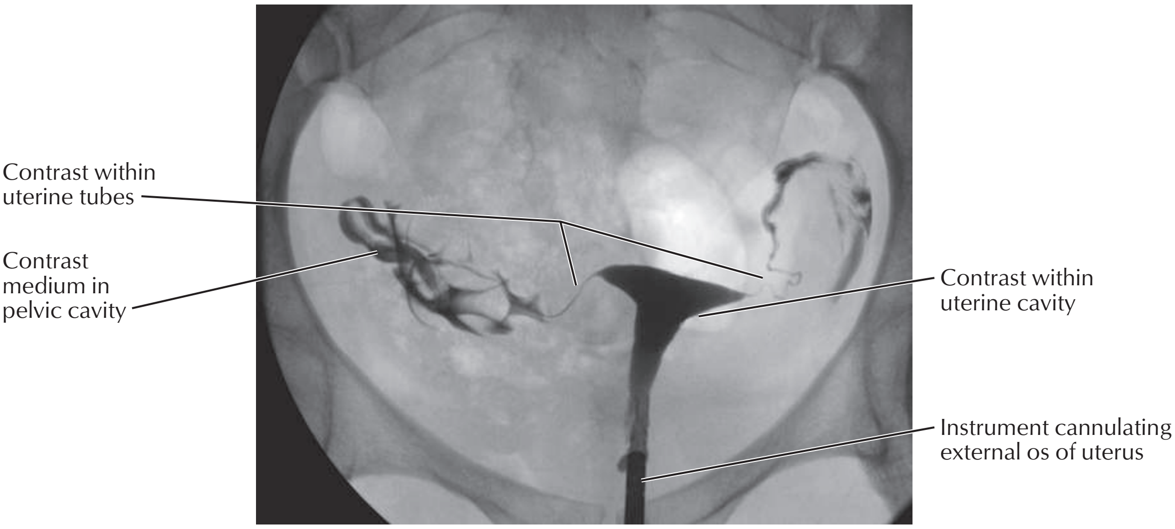

Uterine (fallopian) tube
Ampulla
Fundus of uterus
Uterine ostium
Body of uterus
Uterine part
Isthmus
Infun-dibulum
Folds of uterine tube
Fimbriae
Isthmus of uterus
Internal os
Cervix of uterus
External os
Proper ovarian ligament (ligament of ovary)
Endometrium
Myometrium
Mesometrium (of broad ligament)
Uterine vessels
Cardinal (Mackenrodt's) ligament
Cervical canal with palmate folds
Vaginal fornix
Vagina
Suspensory ligament of ovary (contains ovarian vessels)
Vesicular appendix (hydatid of Morgagni)
Epoöphoron
Follicle (graafian)
Corpus albicans
Corpus luteum
of ovary
Frontal section


Vesicouterine pouch
Uterus through overlying peritoneum
Ureter (retroperitoneal space)
Suspensory ligament of ovary contains ovarian vessels
Right ovary
Ligament of ovary
Right uterine (fallopian) tube
Transverse vesical fold
Inferior epigastric vessels
Medial umbilical fold and ligament (occluded part of umbilical artery)
Inguinal ligament
External iliac vessels
Median umbilical ligament (remnant of urachus)
Round ligament of uterus
Urinary bladder
Pubic symphysis
Prepuce of clitoris
Crus of clitoris (*cut*)
Labia minora
Bulbospongiosus muscle
Urethra
Left ovary and uterine (fallopian) tube (*cut*)
Right uterosacral fold
Sigmoid colon
Uterine (fallopian) tube (*cut*)
Internal iliac artery
Ligament of ovary (*cut*)
Uterine artery
Round ligament of uterus (*cut*)
Rectouterine pouch (of Douglas)
Posterior vaginal fornix
Left ureter and vaginal artery
Cervix of uterus
Anterior vaginal fornix
Rectum
Ureteric orifices
Trigone of bladder
Vagina
C.Machado M.D.

Subdivisions and contents of broad ligament

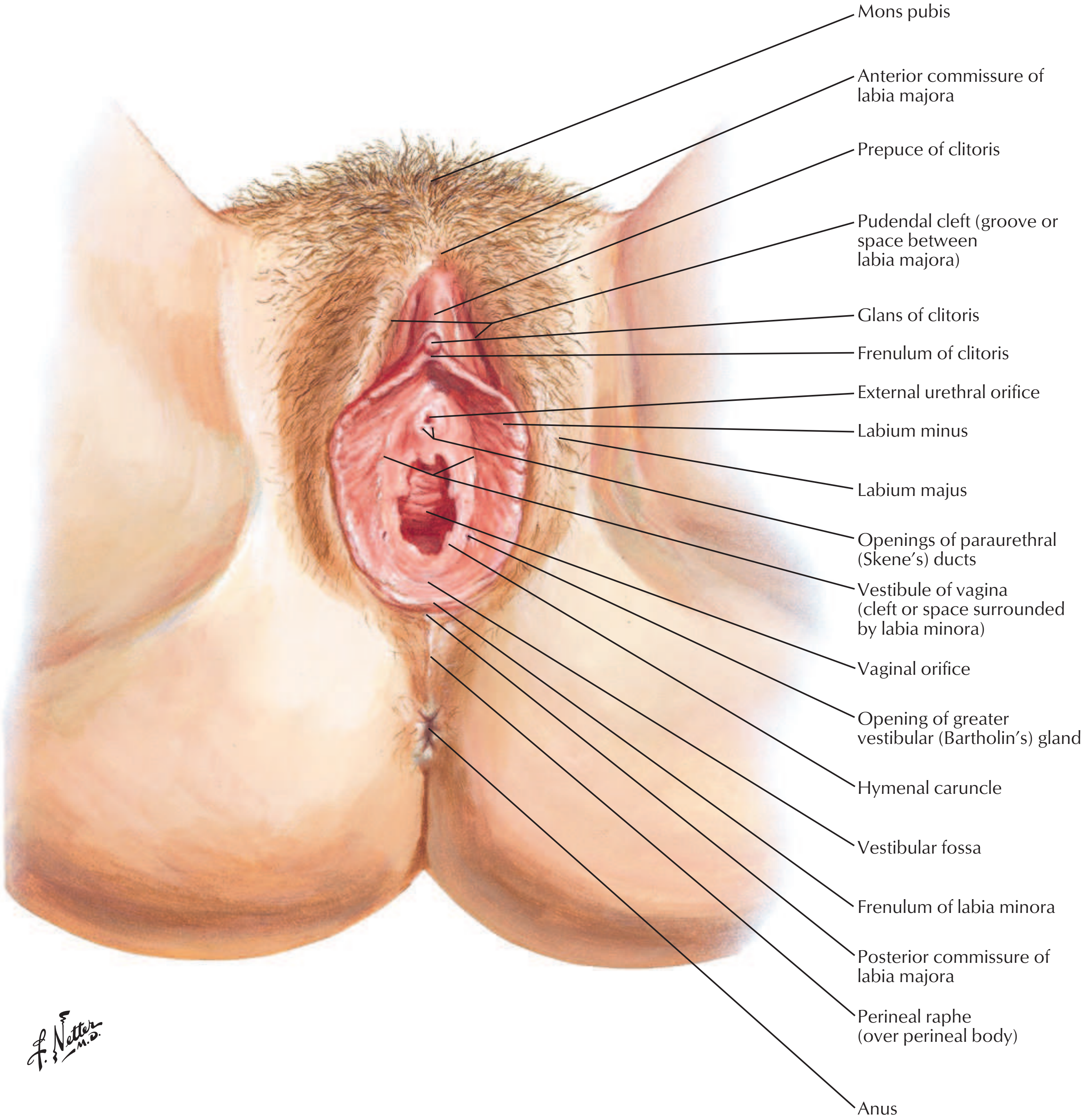

Anterior
Posterior
Suspensory ligament of ovary (containing ovarian vessels)
Infundibulum of uterine tube
External iliac vessels
Fimbriae of uterine tube
Ampulla of uterine tube
Round ligament
Right ovary
Right ureter
Laminae of mesosalpinx
Laminae of mesovarium
Obliterated umbilical artery
Ovarian branches of uterine vessels
Posterior lamina of broad ligament
Anterior lamina of broad ligament
Round ligament
Transverse vesical fold
Vesicouterine (uterovesical) pouch
Uterine artery and venous plexus
Vaginal artery
C.Machado M.D.

Anteroposterior fluoroscopic image obtained during hysterosalpingography

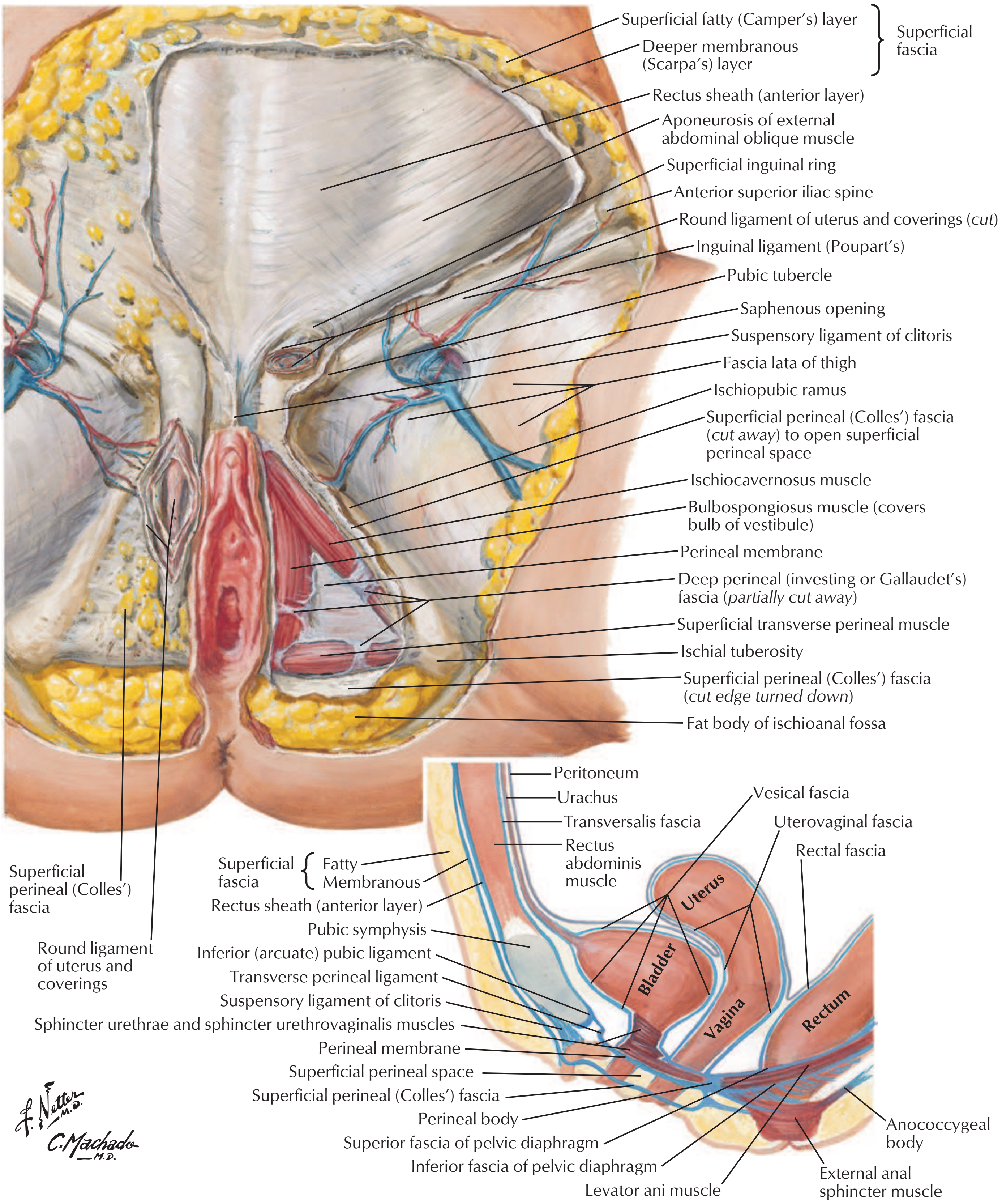

Contrast within uterine tubes
Contrast medium in pelvic cavity
Contrast within uterine cavity
Instrument cannulating external os of uterus

Female Perineum and External Genitalia (Pudendum or Vulva)

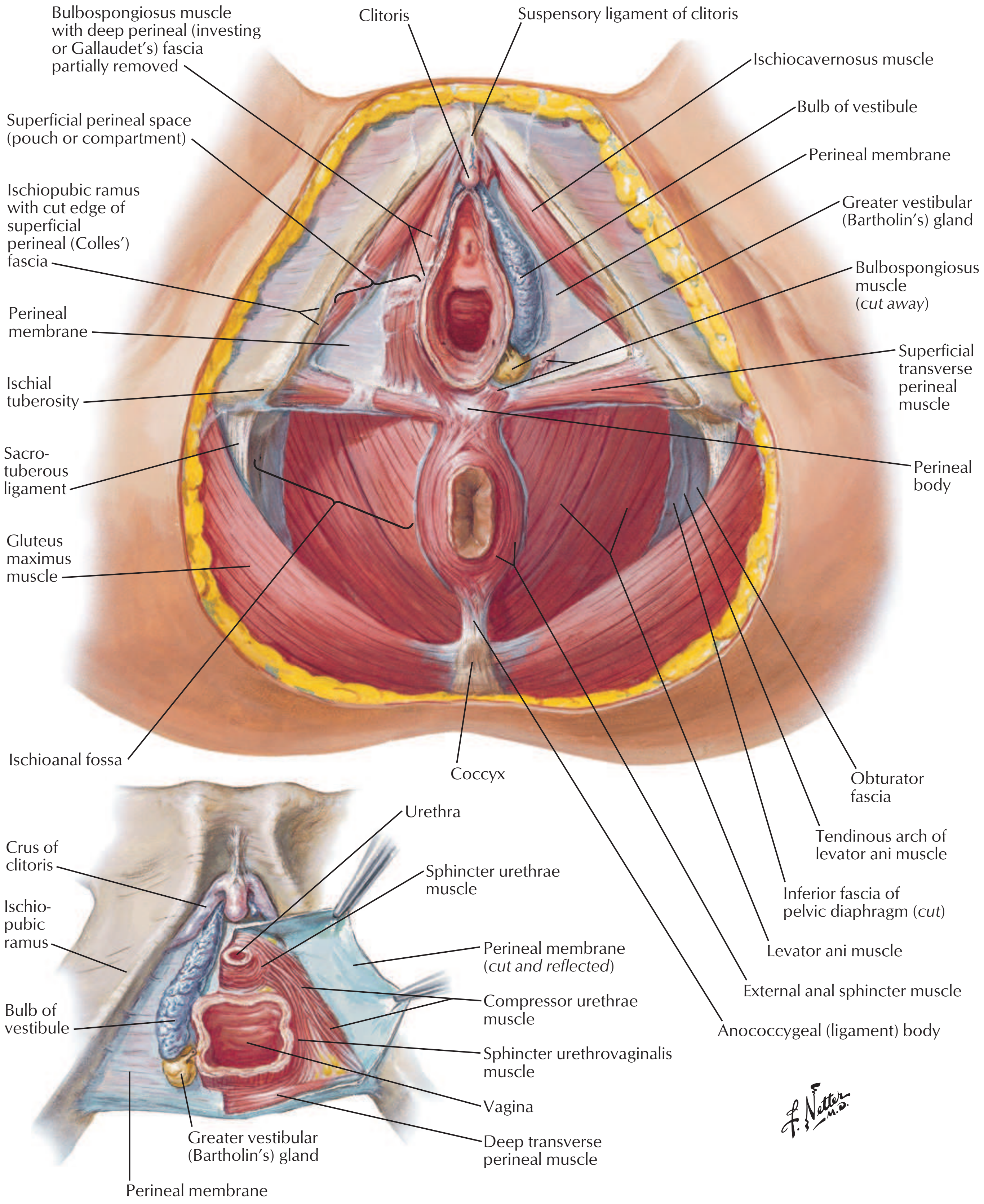
See also Plates 386, 389, 395


Mons pubis
Anterior commissure of labia majora
Prepuce of clitoris
Pudendal cleft (groove or space between labia majora)
Glans of clitoris
Frenulum of clitoris
External urethral orifice
Labium minus
Labium majus
Openings of paraurethral (Skene's) ducts
Vestibule of vagina (cleft or space surrounded by labia minora)
Vaginal orifice
Opening of greater vestibular (Bartholin's) gland
Hymenal caruncle
Vestibular fossa
Frenulum of labia minora
Posterior commissure of labia majora
Perineal raphe (over perineal body)
Anus

Female Perineum (Superficial Dissection)


Superficial fatty (Camper's) layer
Deeper membranous (Scarpa's) layer
Superficial fascia
Rectus sheath (anterior layer)
Aponeurosis of external abdominal oblique muscle
Superficial inguinal ring
Anterior superior iliac spine
Round ligament of uterus and coverings (*cut*)
Inguinal ligament (Poupart's)
Pubic tubercle
Saphenous opening
Suspensory ligament of clitoris
Fascia lata of thigh
Ischiopubic ramus
Superficial perineal (Colles') fascia (*cut away*) to open superficial perineal space
Ischiocavernosus muscle
Bulbospongiosus muscle (covers bulb of vestibule)
Perineal membrane
Deep perineal (investing or Gallaudet's) fascia (*partially cut away*)
Superficial transverse perineal muscle
Ischial tuberosity
Superficial perineal (Colles') fascia (*cut edge turned down*)
Fat body of ischioanal fossa
Superficial perineal (Colles') fascia
Round ligament of uterus and coverings
Peritoneum
Urachus
Transversalis fascia
Rectus abdominis muscle
Vesical fascia
Uterovaginal fascia
Rectal fascia
Superficial fascia
Fatty
Membranous
Rectus sheath (anterior layer)
Pubic symphysis
Inferior (arcuate) pubic ligament
Transverse perineal ligament
Suspensory ligament of clitoris
Sphincter urethrae and sphincter urethrovaginalis muscles
Perineal membrane
Superficial perineal space
Superficial perineal (Colles') fascia
Perineal body
Superior fascia of pelvic diaphragm
Inferior fascia of pelvic diaphragm
Levator ani muscle
External anal sphincter muscle
Anococcygeal body
Uterus
Bladder
Vagina
Rectum
F. Netter M.D.
C. Machado M.D.

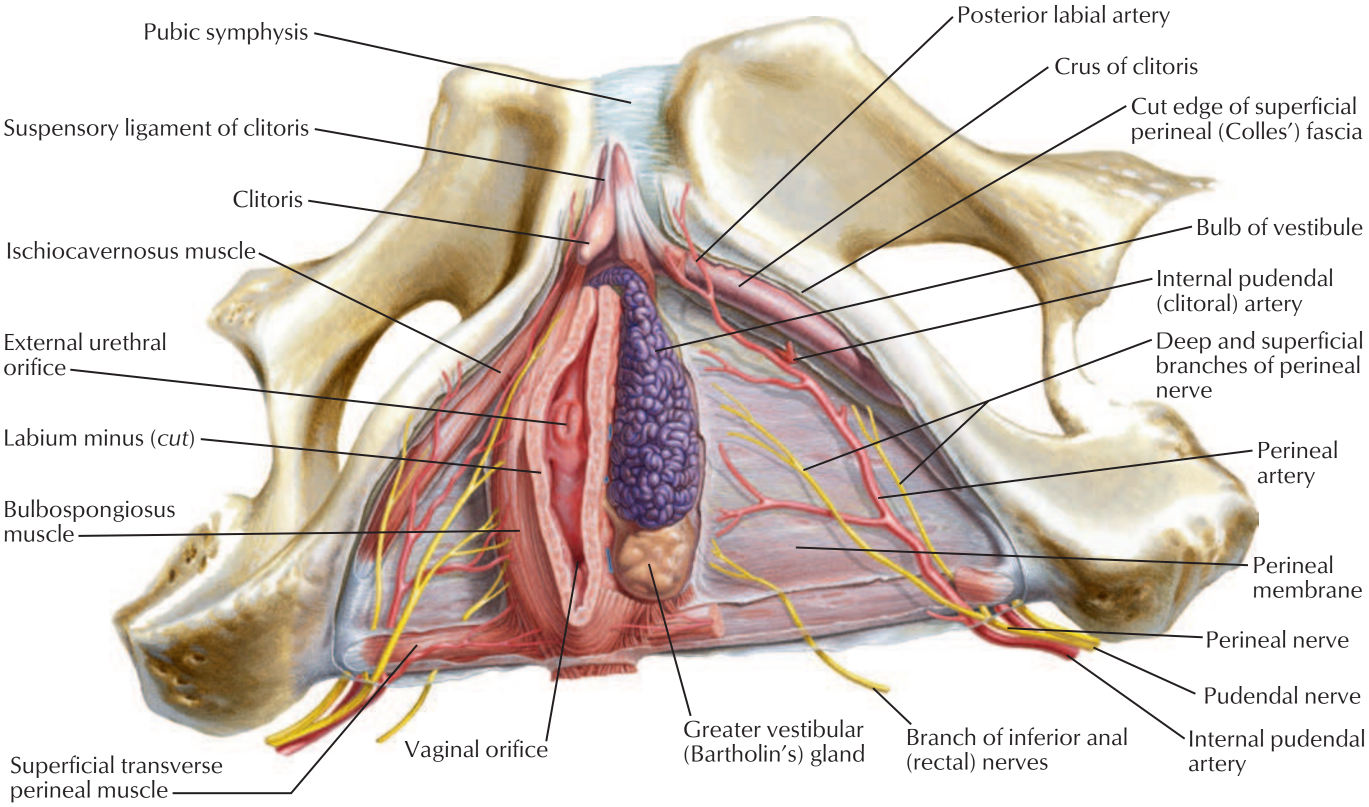
Female Perineum and Deep Perineum


Bulbospongiosus muscle with deep perineal (investing or Gallaudet's) fascia partially removed
Clitoris
Suspensory ligament of clitoris
Ischiocavernosus muscle
Bulb of vestibule
Perineal membrane
Greater vestibular (Bartholin's) gland
Superficial perineal space (pouch or compartment)
Ischiopubic ramus with cut edge of superficial perineal (Colles') fascia
Bulbospongiosus muscle (*cut away*)
Perineal membrane
Superficial transverse perineal muscle
Ischial tuberosity
Sacro-tuberous ligament
Perineal body
Gluteus maximus muscle
Ischioanal fossa
Coccyx
Obturator fascia
Tendinous arch of levator ani muscle
Inferior fascia of pelvic diaphragm (*cut*)
Levator ani muscle
External anal sphincter muscle
Anococcygeal (ligament) body
Urethra
Crus of clitoris
Sphincter urethrae muscle
Ischio-pubic ramus
Perineal membrane (*cut and reflected*)
Compressor urethrae muscle
Bulb of vestibule
Sphincter urethrovaginalis muscle
Vagina
Deep transverse perineal muscle
Greater vestibular (Bartholin's) gland
Perineal membrane

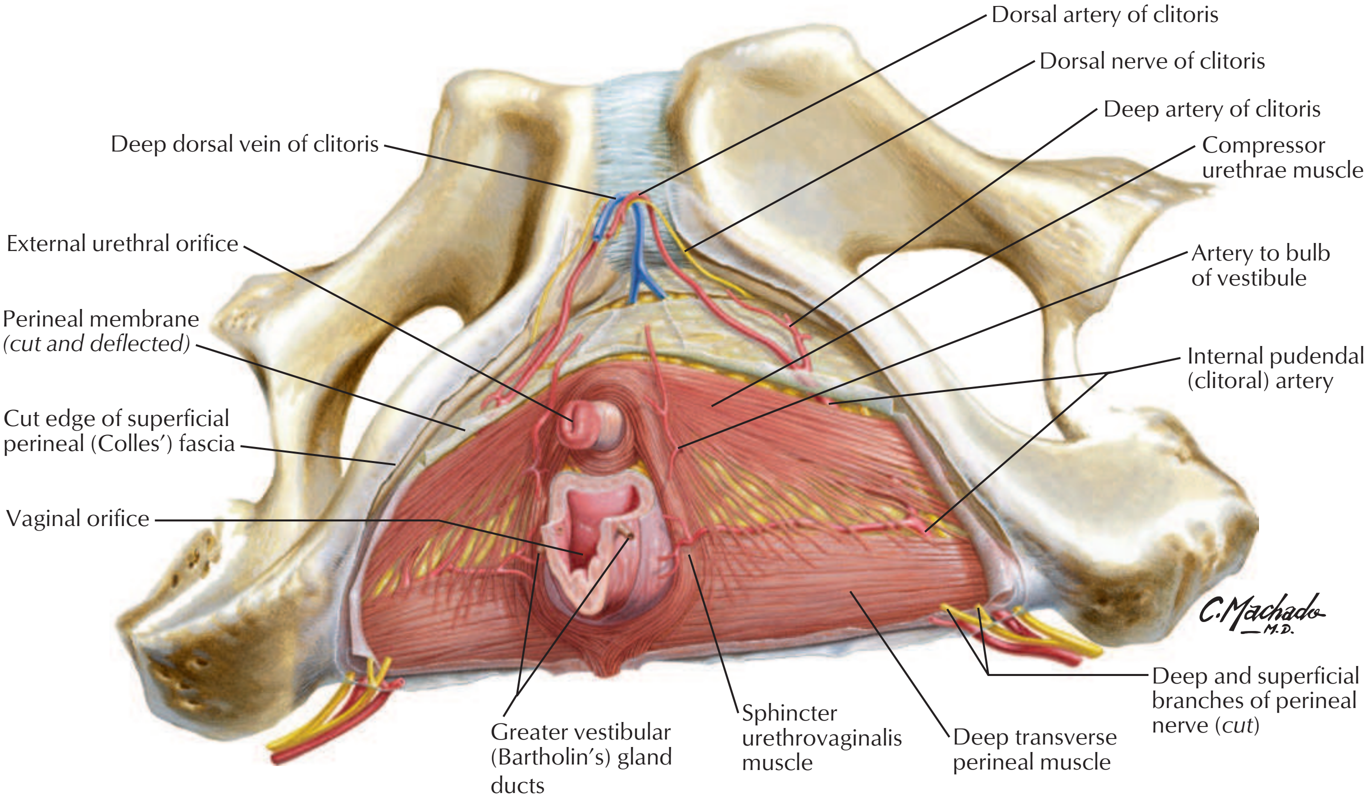
Female Perineal Spaces

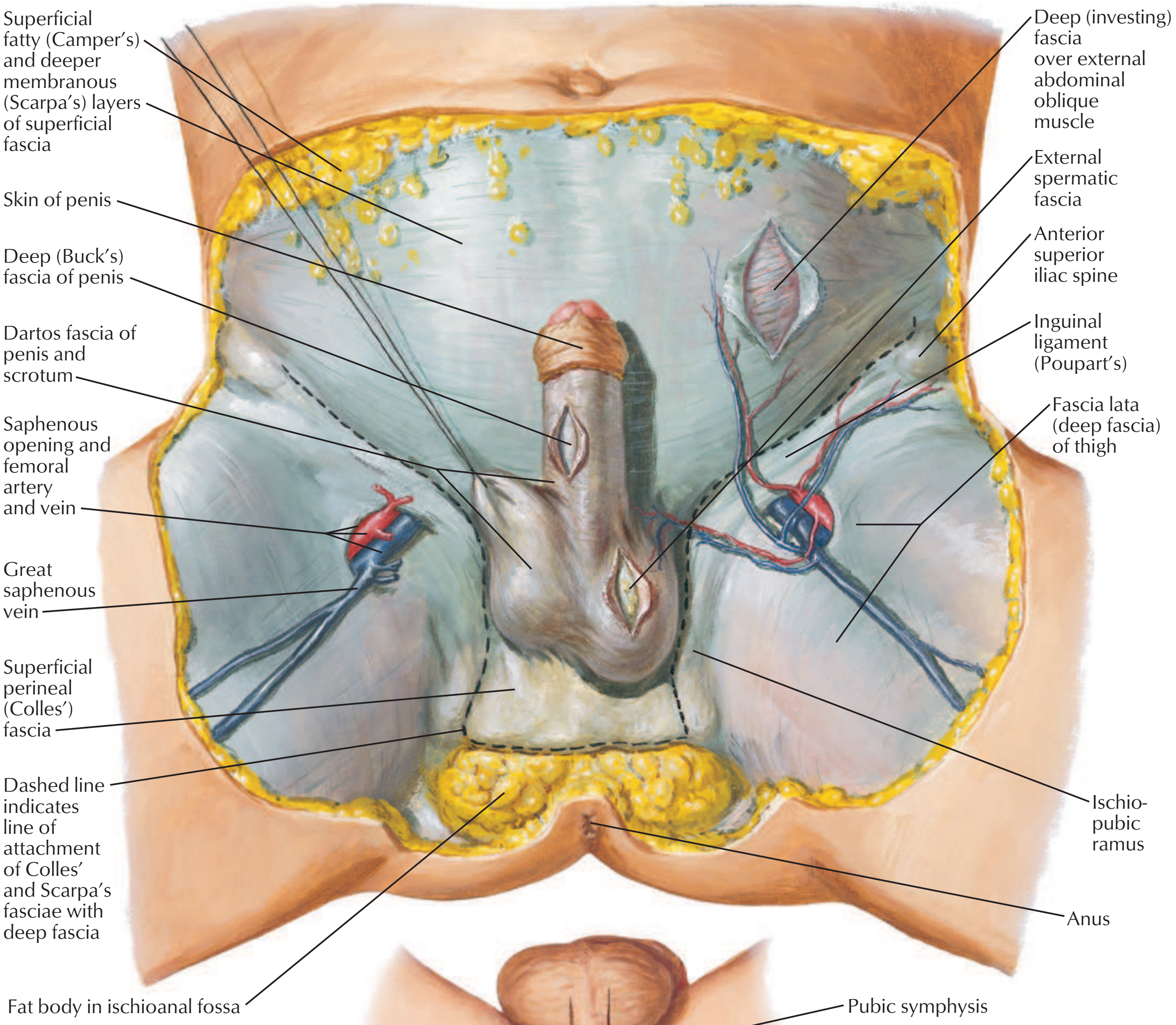
See also Plates 386, 395

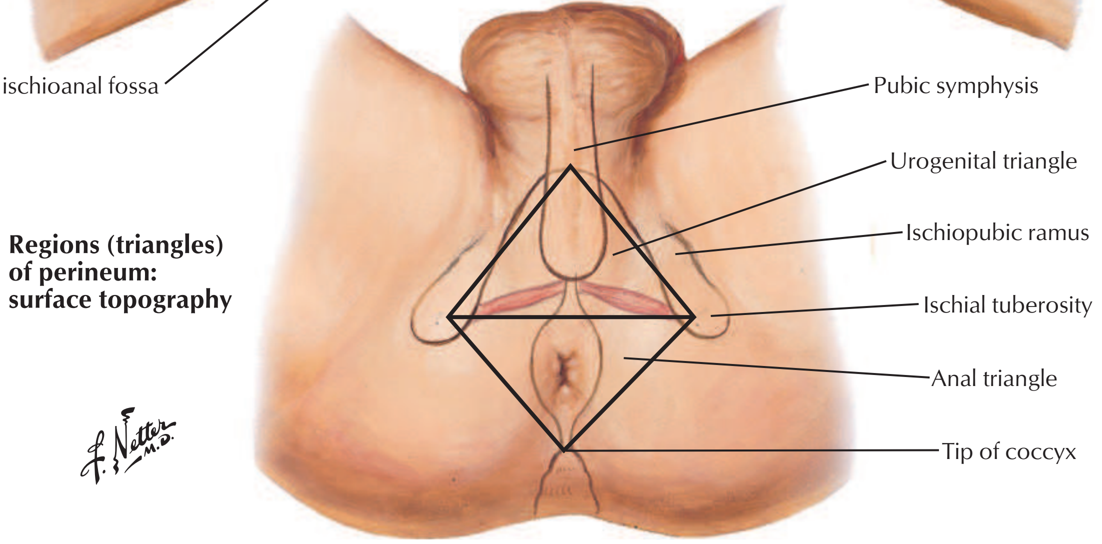
Superficial perineal space


Pubic symphysis
Suspensory ligament of clitoris
Clitoris
Ischiocavernosus muscle
External urethral orifice
Labium minus (*cut*)
Bulbospongiosus muscle
Superficial transverse perineal muscle
Vaginal orifice
Greater vestibular (Bartholin's) gland
Branch of inferior anal (rectal) nerves
Posterior labial artery
Crus of clitoris
Cut edge of superficial perineal (Colles') fascia
Bulb of vestibule
Internal pudendal (clitoral) artery
Deep and superficial branches of perineal nerve
Perineal artery
Perineal membrane
Perineal nerve
Pudendal nerve
Internal pudendal artery

Deep perineal space


Deep dorsal vein of clitoris
External urethral orifice
Perineal membrane *(cut and deflected)*
Cut edge of superficial perineal (Colles') fascia
Vaginal orifice
Greater vestibular (Bartholin's) gland ducts
Sphincter urethrovaginalis muscle
Deep transverse perineal muscle
Dorsal artery of clitoris
Dorsal nerve of clitoris
Deep artery of clitoris
Compressor urethrae muscle
Artery to bulb of vestibule
Internal pudendal (clitoral) artery
Deep and superficial branches of perineal nerve (*cut*)
C.Machado M.D.

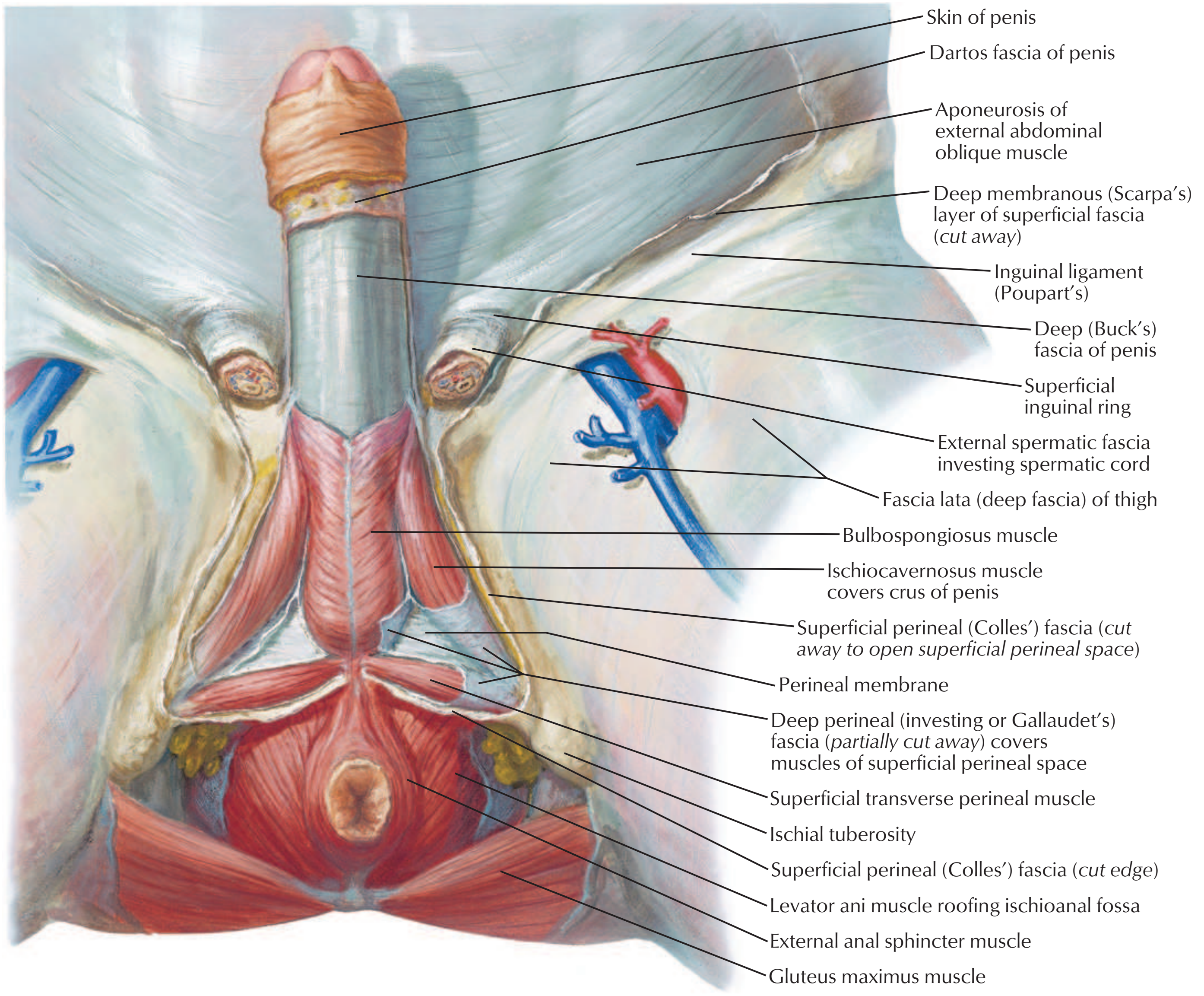

Superficial fatty (Camper's) and deeper membranous (Scarpa's) layers of superficial fascia
Skin of penis
Deep (Buck's) fascia of penis
Dartos fascia of penis and scrotum
Saphenous opening and femoral artery and vein
Great saphenous vein
Superficial perineal (Colles') fascia
Dashed line indicates line of attachment of Colles' and Scarpa's fasciae with deep fascia
Fat body in ischioanal fossa
Deep (investing) fascia over external abdominal oblique muscle
External spermatic fascia
Anterior superior iliac spine
Inguinal ligament (Poupart's)
Fascia lata (deep fascia) of thigh
Ischio-pubic ramus
Anus

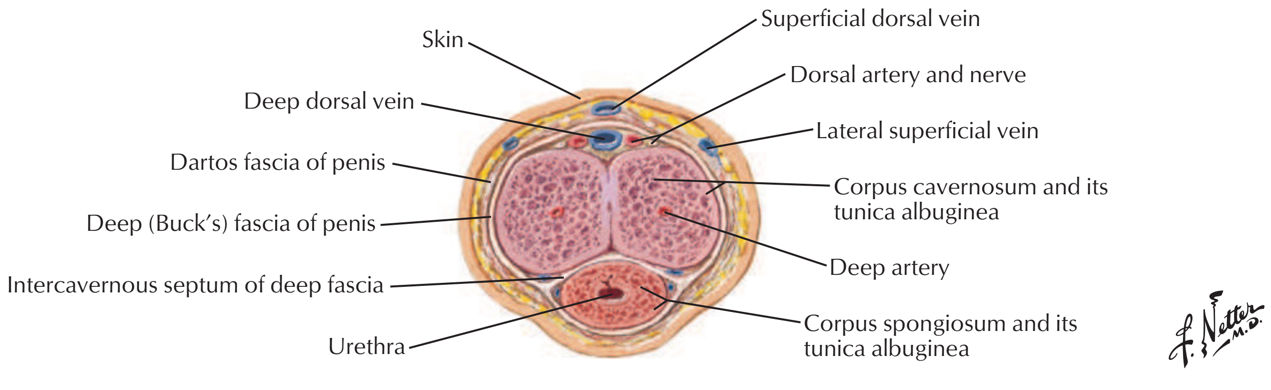

Pubic symphysis
Urogenital triangle
Ischiopubic ramus
Ischial tuberosity
Anal triangle
Tip of coccyx

Regions (triangles) of perineum: surface topography

Male Perineum and External Genitalia (Deeper Dissection)

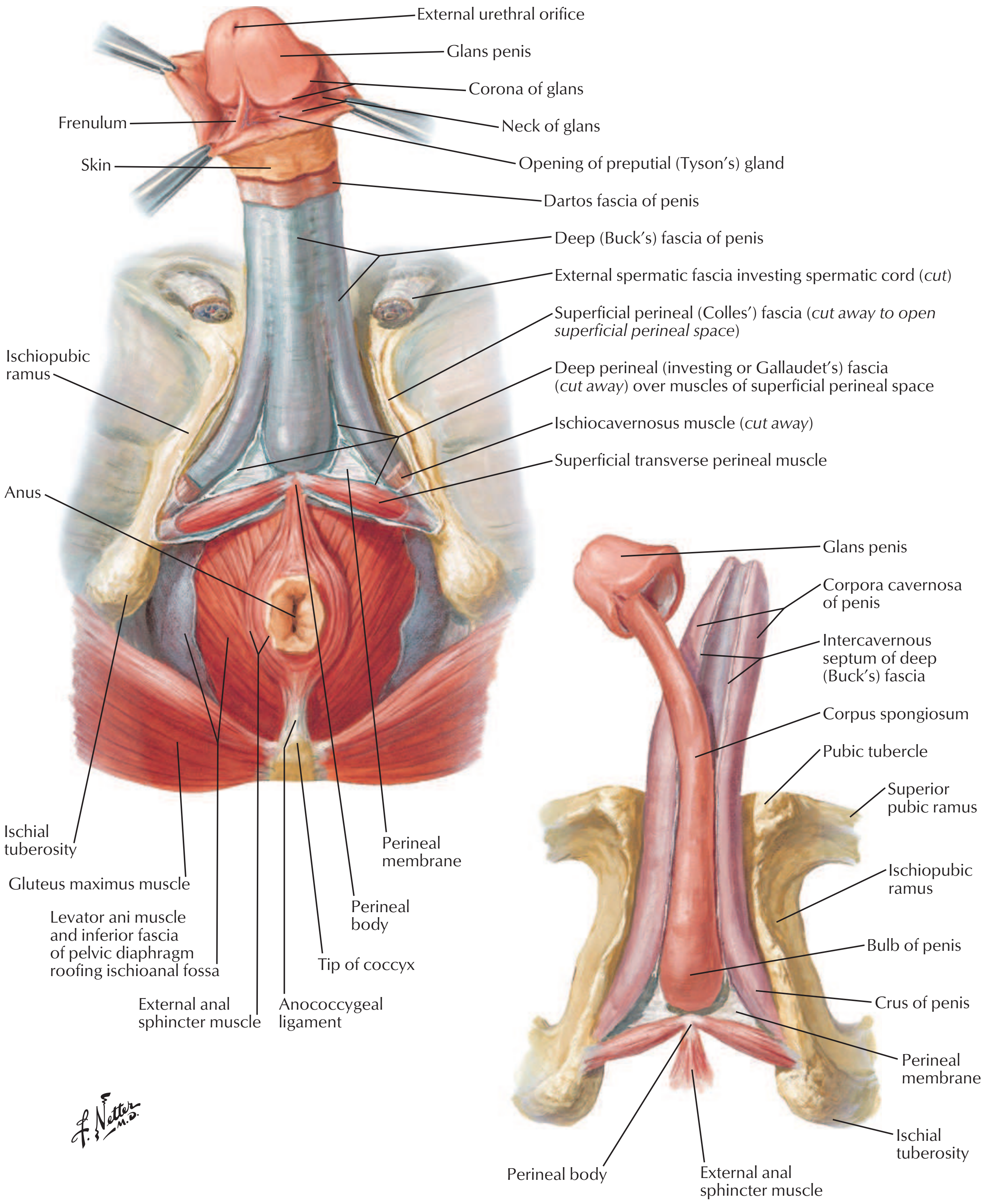
See also Plates 382, 384, 387

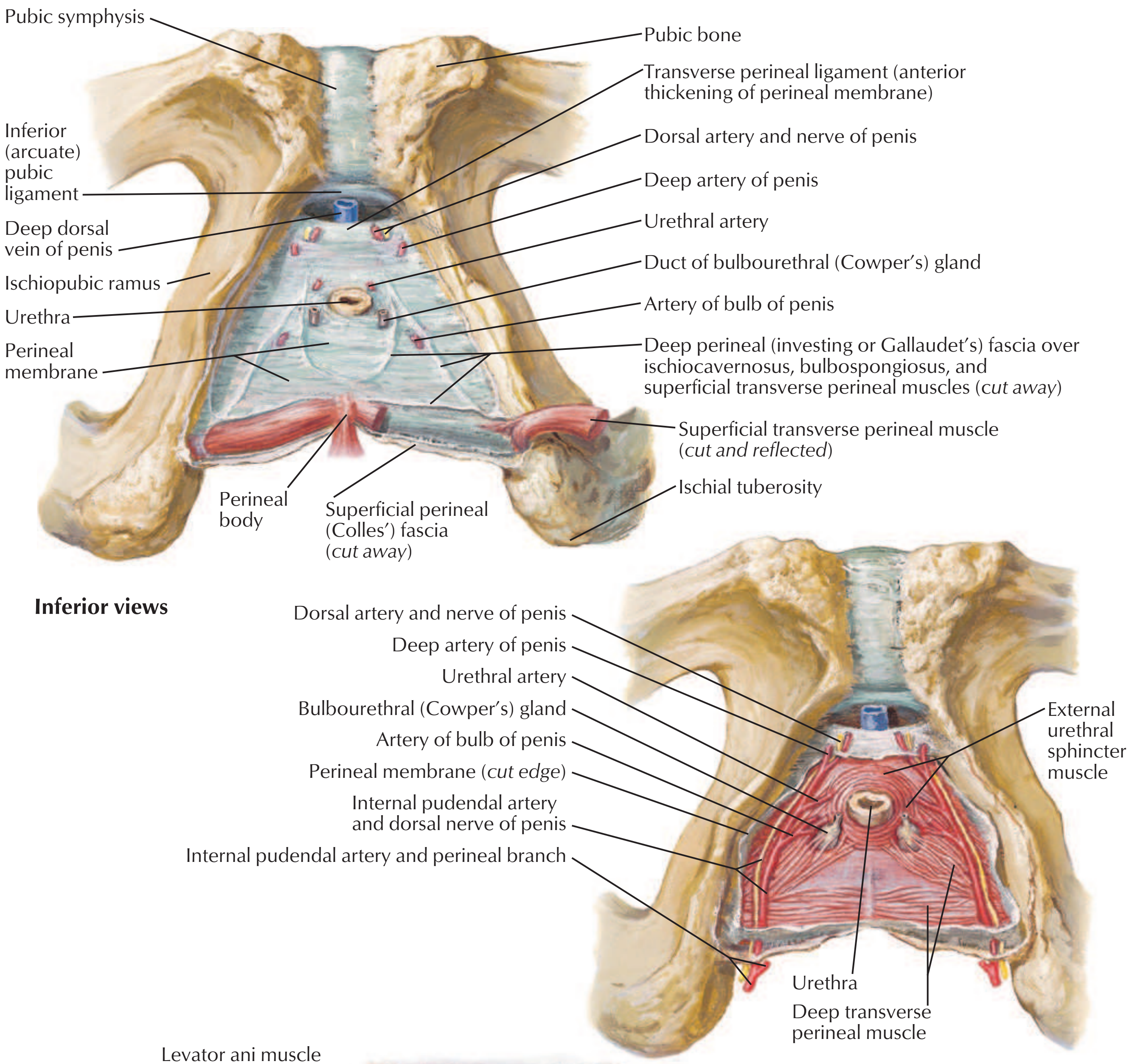

Skin of penis
Dartos fascia of penis
Aponeurosis of external abdominal oblique muscle
Deep membranous (Scarpa's) layer of superficial fascia (*cut away*)
Inguinal ligament (Poupart's)
Deep (Buck's) fascia of penis
Superficial inguinal ring
External spermatic fascia investing spermatic cord
Fascia lata (deep fascia) of thigh
Bulbospongiosus muscle
Ischiocavernosus muscle covers crus of penis
Superficial perineal (Colles') fascia (*cut away to open superficial perineal space*)
Perineal membrane
Deep perineal (investing or Gallaudet's) fascia (*partially cut away*) covers muscles of superficial perineal space
Superficial transverse perineal muscle
Ischial tuberosity
Superficial perineal (Colles') fascia (*cut edge*)
Levator ani muscle roofing ischioanal fossa
External anal sphincter muscle
Gluteus maximus muscle


Skin
Superficial dorsal vein
Deep dorsal vein
Dorsal artery and nerve
Lateral superficial vein
Dartos fascia of penis
Corpus cavernosum and its tunica albuginea
Deep (Buck's) fascia of penis
Deep artery
Intercavernous septum of deep fascia
Urethra
Corpus spongiosum and its tunica albuginea
F. Netter M.D.

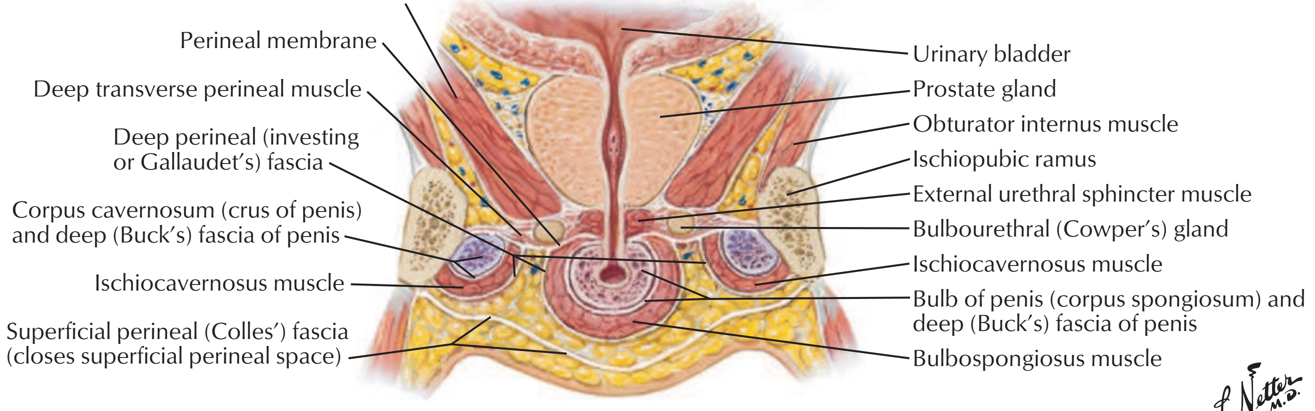
Transverse section through body of penis

Penis


External urethral orifice
Glans penis
Corona of glans
Neck of glans
Frenulum
Skin
Opening of preputial (Tyson's) gland
Dartos fascia of penis
Deep (Buck's) fascia of penis
External spermatic fascia investing spermatic cord (*cut*)
Superficial perineal (Colles') fascia (*cut away to open superficial perineal space*)
Ischiopubic ramus
Deep perineal (investing or Gallaudet's) fascia (*cut away*) over muscles of superficial perineal space
Ischiocavernosus muscle (*cut away*)
Superficial transverse perineal muscle
Anus
Ischial tuberosity
Gluteus maximus muscle
Levator ani muscle and inferior fascia of pelvic diaphragm roofing ischioanal fossa
External anal sphincter muscle
Anococcygeal ligament
Tip of coccyx
Perineal body
Perineal membrane
Glans penis
Corpora cavernosa of penis
Intercavernous septum of deep (Buck's) fascia
Corpus spongiosum
Pubic tubercle
Superior pubic ramus
Ischiopubic ramus
Bulb of penis
Crus of penis
Perineal membrane
Ischial tuberosity
Perineal body
External anal sphincter muscle


Pubic symphysis
Inferior (arcuate) pubic ligament
Deep dorsal vein of penis
Ischiopubic ramus
Urethra
Perineal membrane
Perineal body
Superficial perineal (Colles') fascia (*cut away*)
Pubic bone
Transverse perineal ligament (anterior thickening of perineal membrane)
Dorsal artery and nerve of penis
Deep artery of penis
Urethral artery
Duct of bulbourethral (Cowper's) gland
Artery of bulb of penis
Deep perineal (investing or Gallaudet's) fascia over ischiocavernosus, bulbospongiosus, and superficial transverse perineal muscles (*cut away*)
Superficial transverse perineal muscle (*cut and reflected*)
Ischial tuberosity
Dorsal artery and nerve of penis
Deep artery of penis
Urethral artery
Bulbourethral (Cowper's) gland
Artery of bulb of penis
Perineal membrane (*cut edge*)
Internal pudendal artery and dorsal nerve of penis
Internal pudendal artery and perineal branch
External urethral sphincter muscle
Urethra
Deep transverse perineal muscle

Inferior views

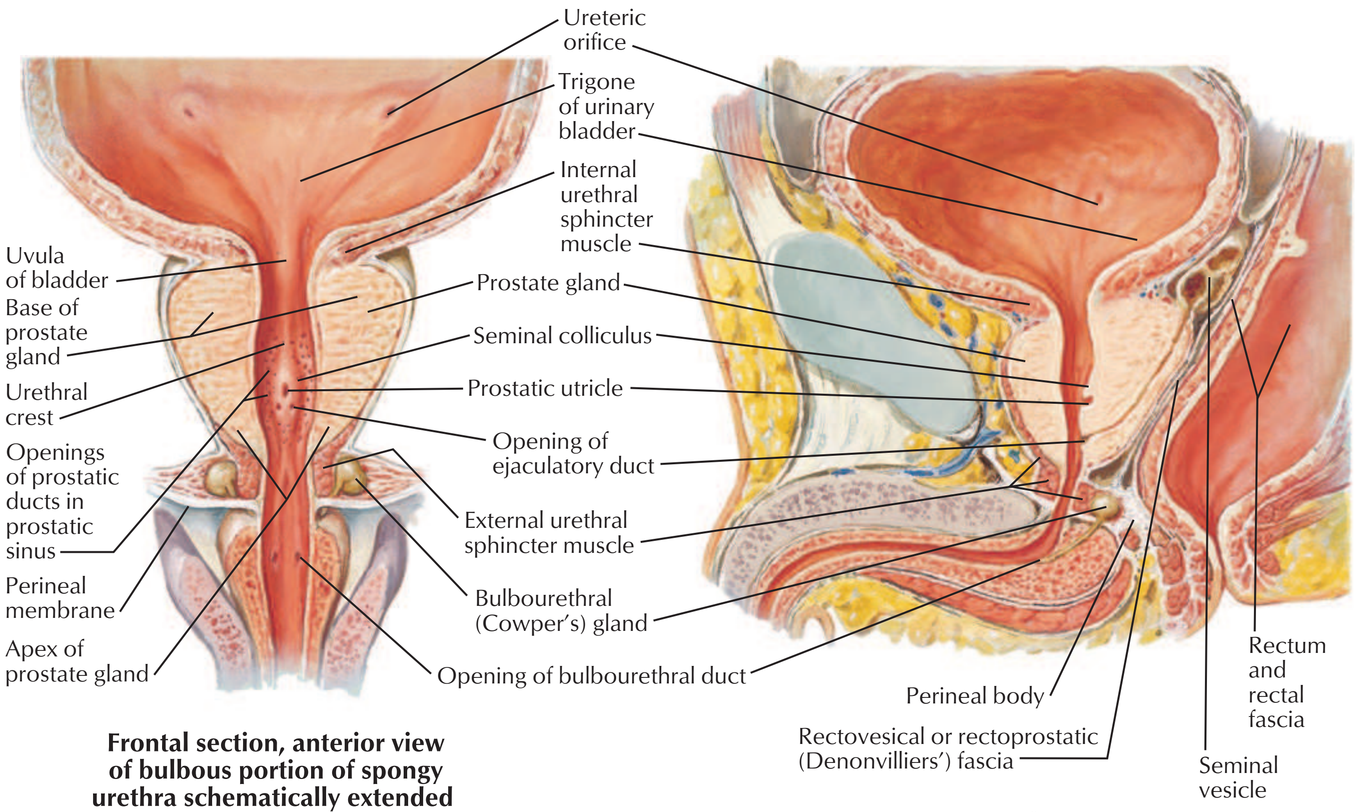

Levator ani muscle
Perineal membrane
Deep transverse perineal muscle
Deep perineal (investing or Gallaudet's) fascia
Corpus cavernosum (crus of penis) and deep (Buck's) fascia of penis
Ischiocavernosus muscle
Superficial perineal (Colles') fascia (closes superficial perineal space)
Urinary bladder
Prostate gland
Obturator internus muscle
Ischiopubic ramus
External urethral sphincter muscle
Bulbourethral (Cowper's) gland
Ischiocavernosus muscle
Bulb of penis (corpus spongiosum) and deep (Buck's) fascia of penis
Bulbospongiosus muscle

Frontal section, anterior view of perineum: schema

F. Netter M.D.
C. Machado M.D.

Prostate Gland and Seminal Vesicles

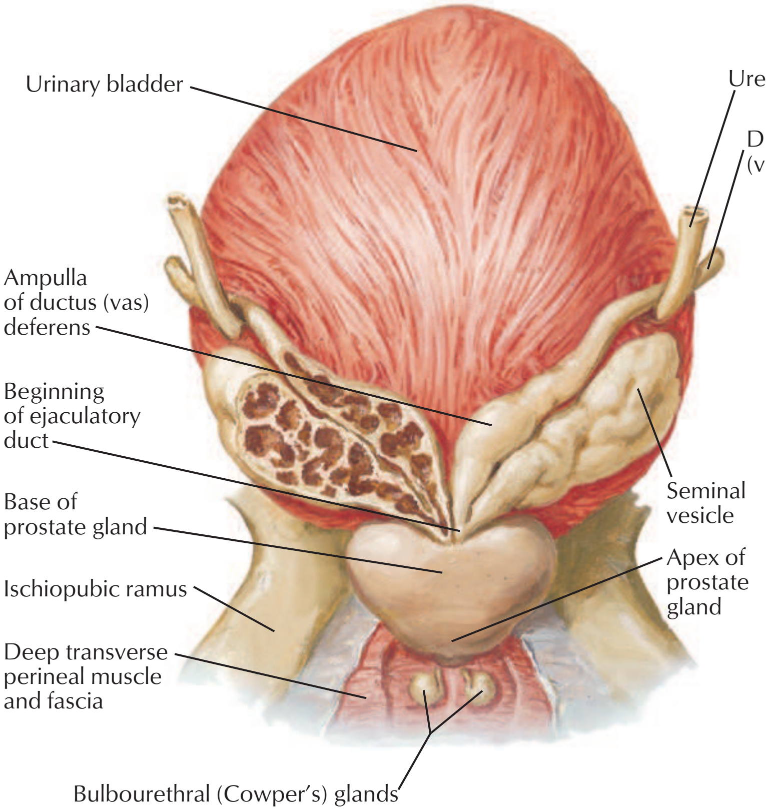
See also Plates 349, 352, 385


Ureteric orifice
Trigone of urinary bladder
Internal urethral sphincter muscle
Uvula of bladder
Base of prostate gland
Prostate gland
Seminal colliculus
Urethral crest
Prostatic utricle
Openings of prostatic ducts in prostatic sinus
Opening of ejaculatory duct
External urethral sphincter muscle
Perineal membrane
Bulbourethral (Cowper's) gland
Apex of prostate gland
Opening of bulbourethral duct
Perineal body
Rectum and rectal fascia
Rectovesical or rectoprostatic (Denonvilliers') fascia
Seminal vesicle

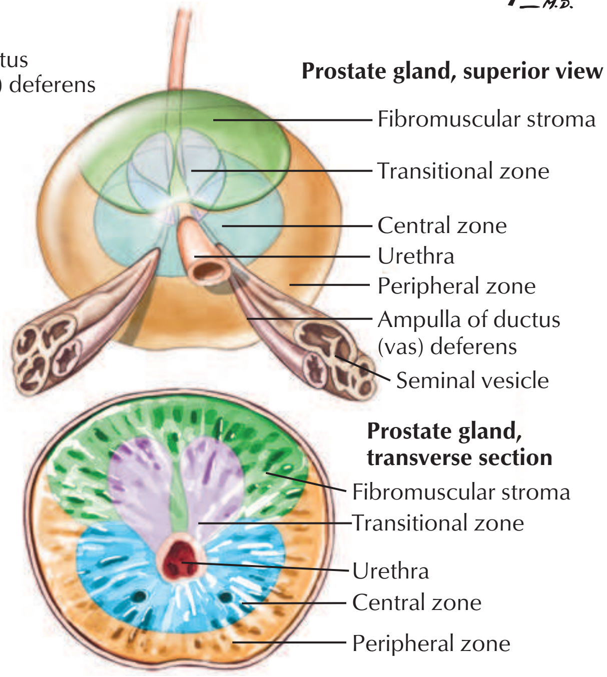
Frontal section, anterior view of bulbous portion of spongy urethra schematically extended

Sagittal section

F. Netter M.D.
C.Machado M.D.


Urinary bladder
Ureter
Ductus (vas) deferens
Ampulla of ductus (vas) deferens
Beginning of ejaculatory duct
Seminal vesicle
Base of prostate gland
Apex of prostate gland
Ischiopubic ramus
Deep transverse perineal muscle and fascia
Bulbourethral (Cowper's) glands

Posterior view

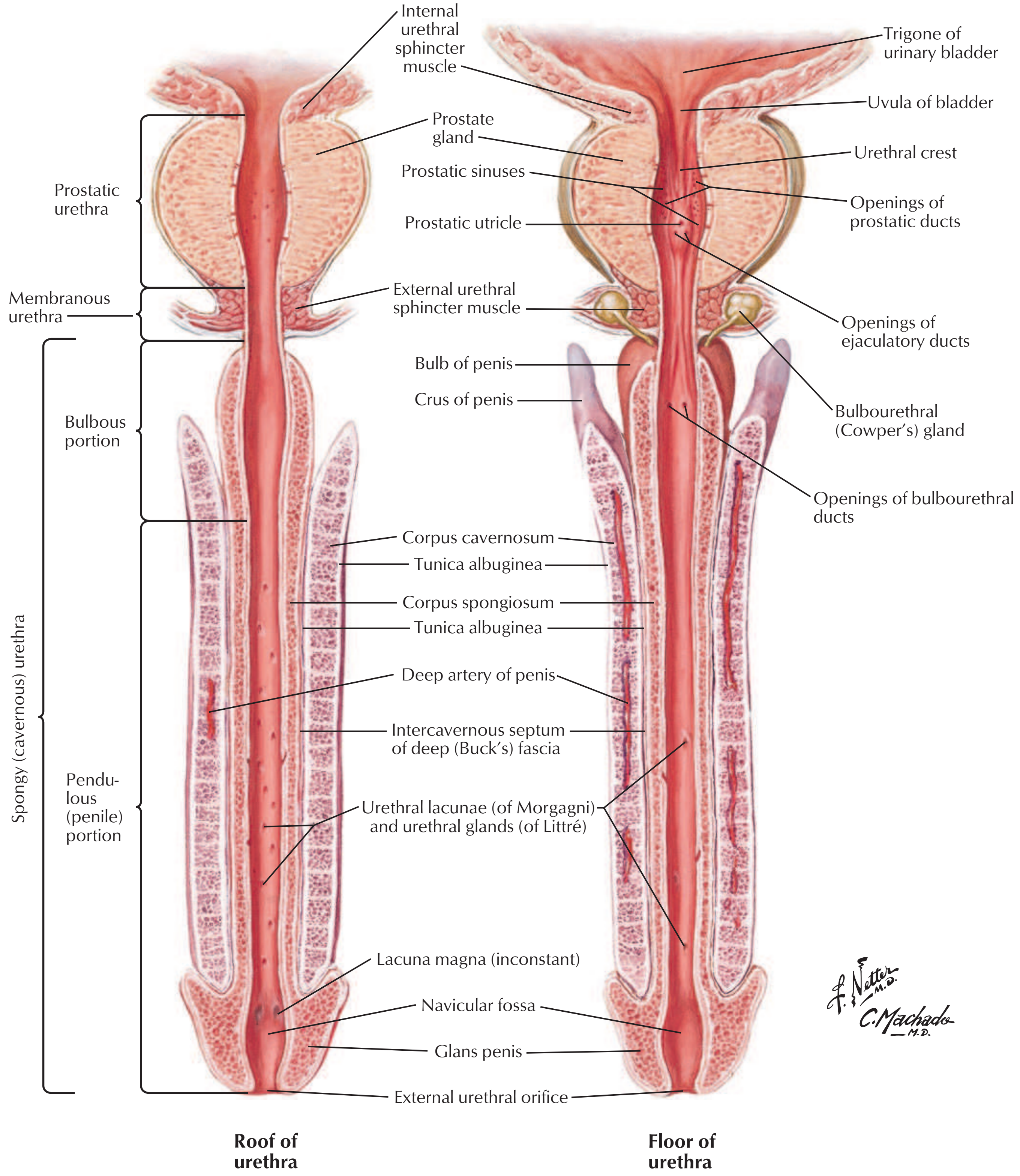

Prostate gland, superior view

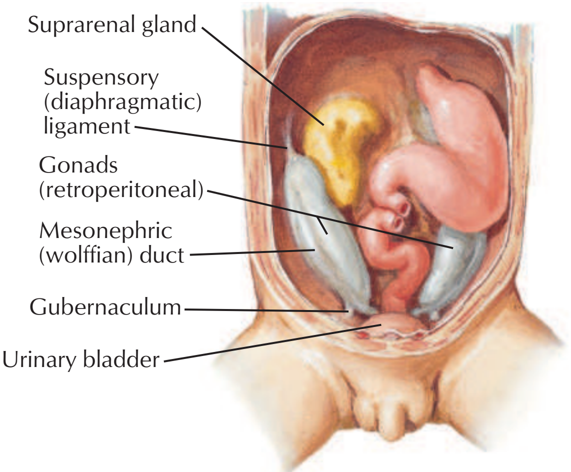
Fibromuscular stroma
Transitional zone
Central zone
Urethra
Peripheral zone
Ampulla of ductus (vas) deferens
Seminal vesicle

Prostate gland, transverse section

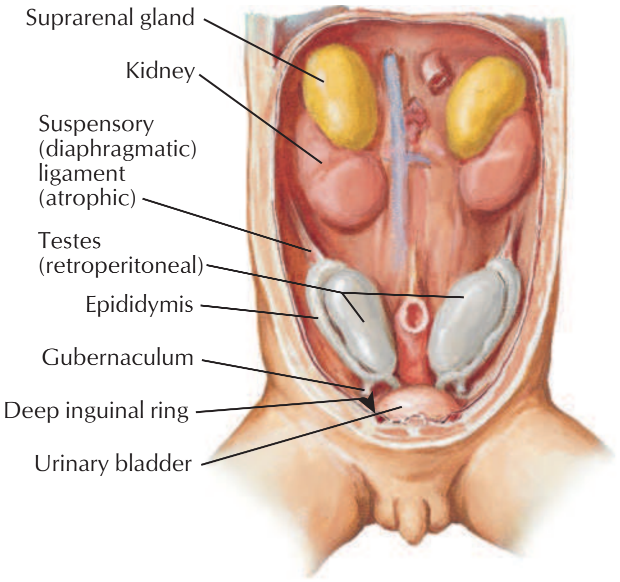
Fibromuscular stroma
Transitional zone
Urethra
Central zone
Peripheral zone

Posterior view

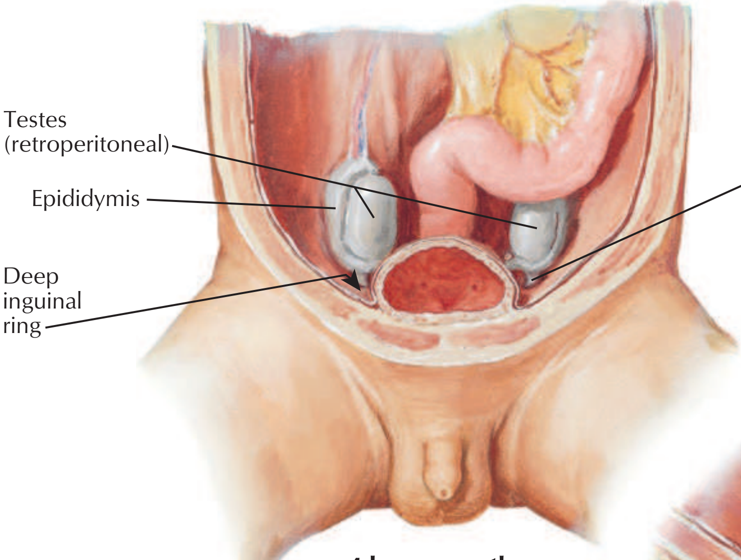

Internal urethral sphincter muscle
Trigone of urinary bladder
Uvula of bladder
Prostate gland
Urethral crest
Prostatic sinuses
Prostatic urethra
Openings of prostatic ducts
Prostatic utricle
Membranous urethra
External urethral sphincter muscle
Openings of ejaculatory ducts
Bulb of penis
Crus of penis
Bulbourethral (Cowper's) gland
Bulbous portion
Openings of bulbourethral ducts
Corpus cavernosum
Tunica albuginea
Corpus spongiosum
Tunica albuginea
Spongy (cavernous) urethra
Deep artery of penis
Intercavernous septum of deep (Buck's) fascia
Pendu-lous (penile) portion
Urethral lacunae (of Morgagni) and urethral glands (of Littré)
Lacuna magna (inconstant)
Navicular fossa
Glans penis
External urethral orifice
Roof of urethra
Floor of urethra


Suprarenal gland
Suspensory (diaphragmatic) ligament
Gonads (retroperitoneal)
Mesonephric (wolffian) duct
Gubernaculum
Urinary bladder

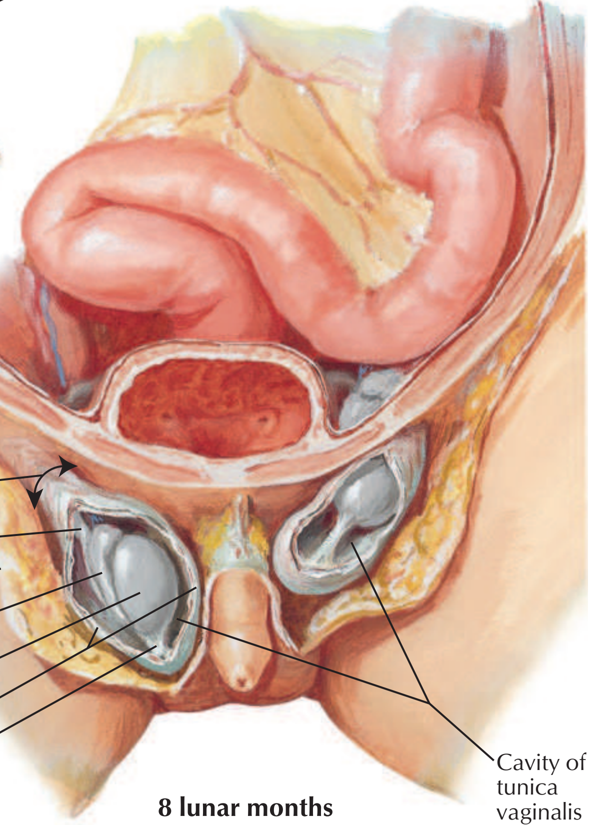
8 weeks
(22.5-mm crown–rump)


Suprarenal gland
Kidney
Suspensory (diaphragmatic) ligament (atrophic)
Testes (retroperitoneal)
Epididymis
Gubernaculum
Deep inguinal ring
Urinary bladder

11 weeks
(43-mm crown–rump)

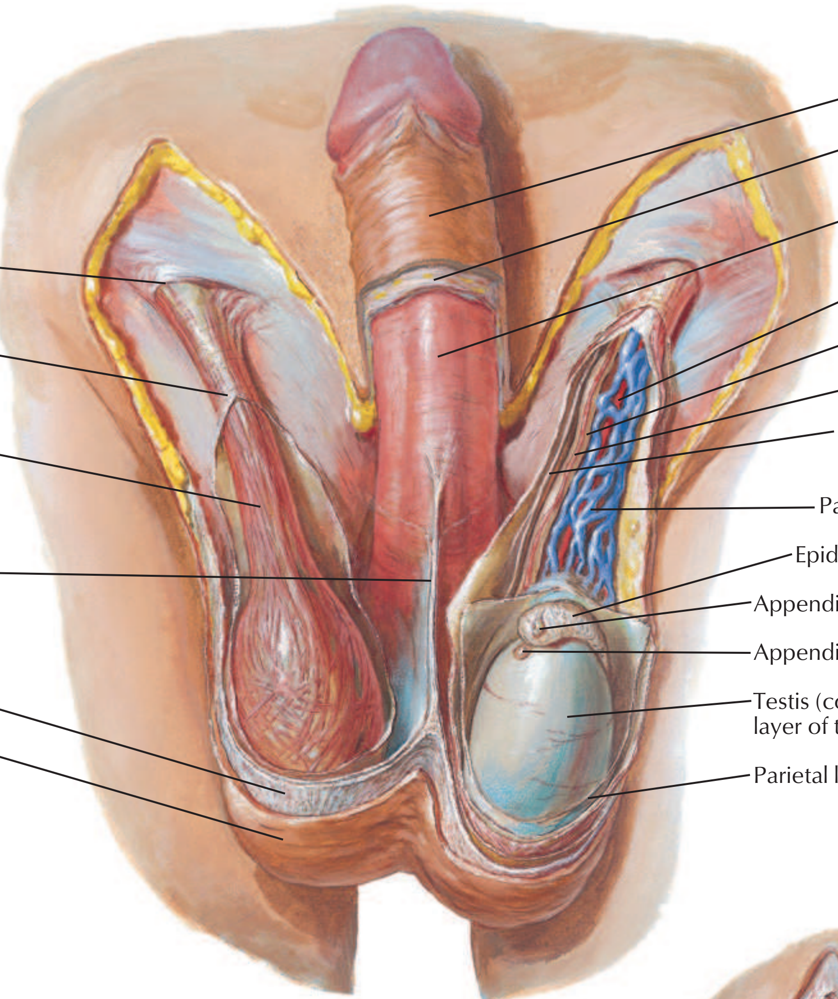

Testes (retroperitoneal)
Epididymis
Deep inguinal ring
Gubernaculum

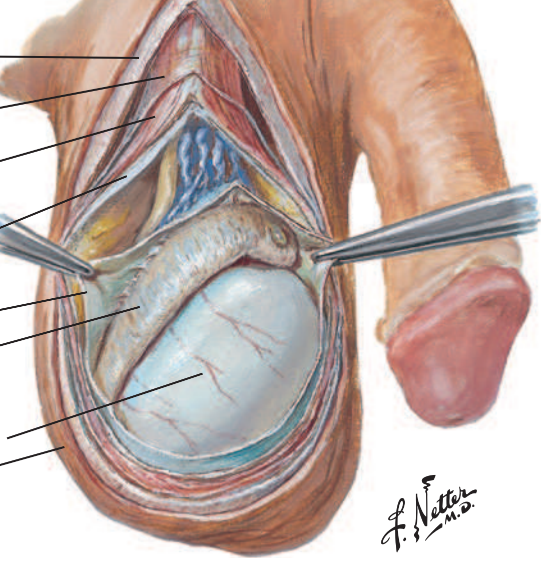
4 lunar months
(107-mm crown–rump)


Superficial inguinal ring
Ductus (vas) deferens
Scrotum (*cut open*)
Epididymis
Testis
Processus vaginalis
Gubernaculum
Cavity of tunica vaginalis (*cut open*)

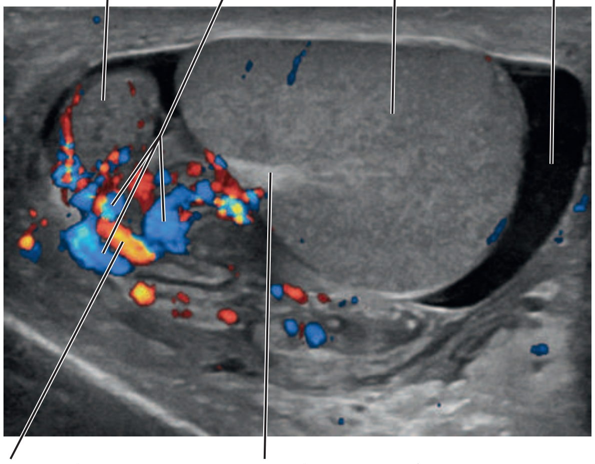
8 lunar months
(26-cm crown–rump)

See also Plates 324, 349


Superficial inguinal ring
External spermatic fascia
Cremaster muscle and fascia
Septum of scrotum (formed by dartos fascia)
Dartos fascia of scrotum
Skin of scrotum
Skin of penis
Dartos fascia of penis
Deep (Buck's) fascia of penis
Testicular artery
Ductus deferens
Artery to ductus deferens
Genital branch of genitofemoral nerve
Pampiniform (venous) plexus
Epididymis (head)
Appendix of epididymis
Appendix of testis
Testis (covered by visceral layer of tunica vaginalis testis)
Parietal layer of tunica vaginalis testis

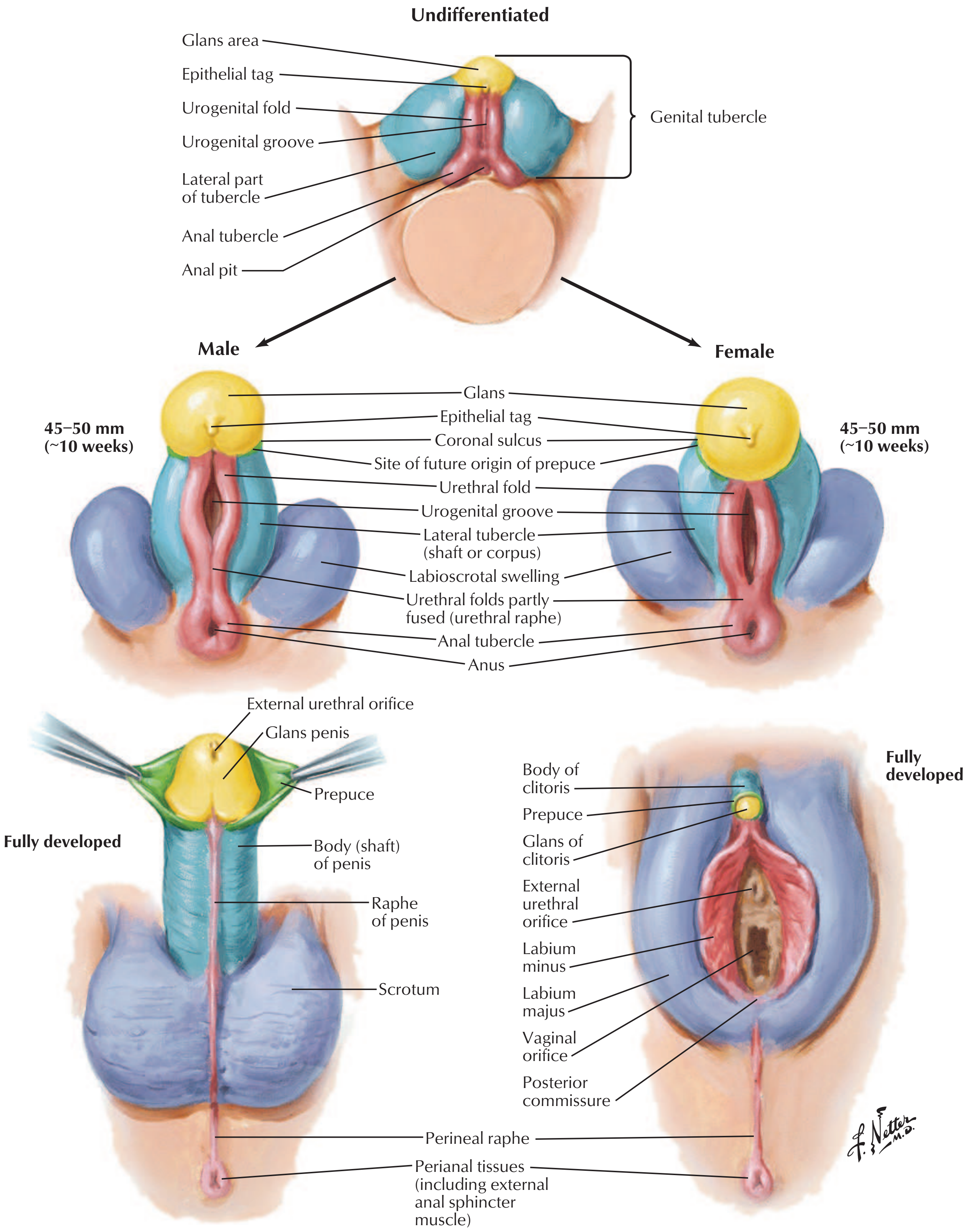

Dartos fascia of scrotum
External spermatic fascia
Cremaster muscle and fascia
Internal spermatic fascia
Parietal layer of tunica vaginalis testis
Epididymis (body)
Testis (covered by visceral layer of tunica vaginalis testis)
Skin of scrotum
F. Netter M.D.

Color Doppler ultrasound: transverse view of testicle

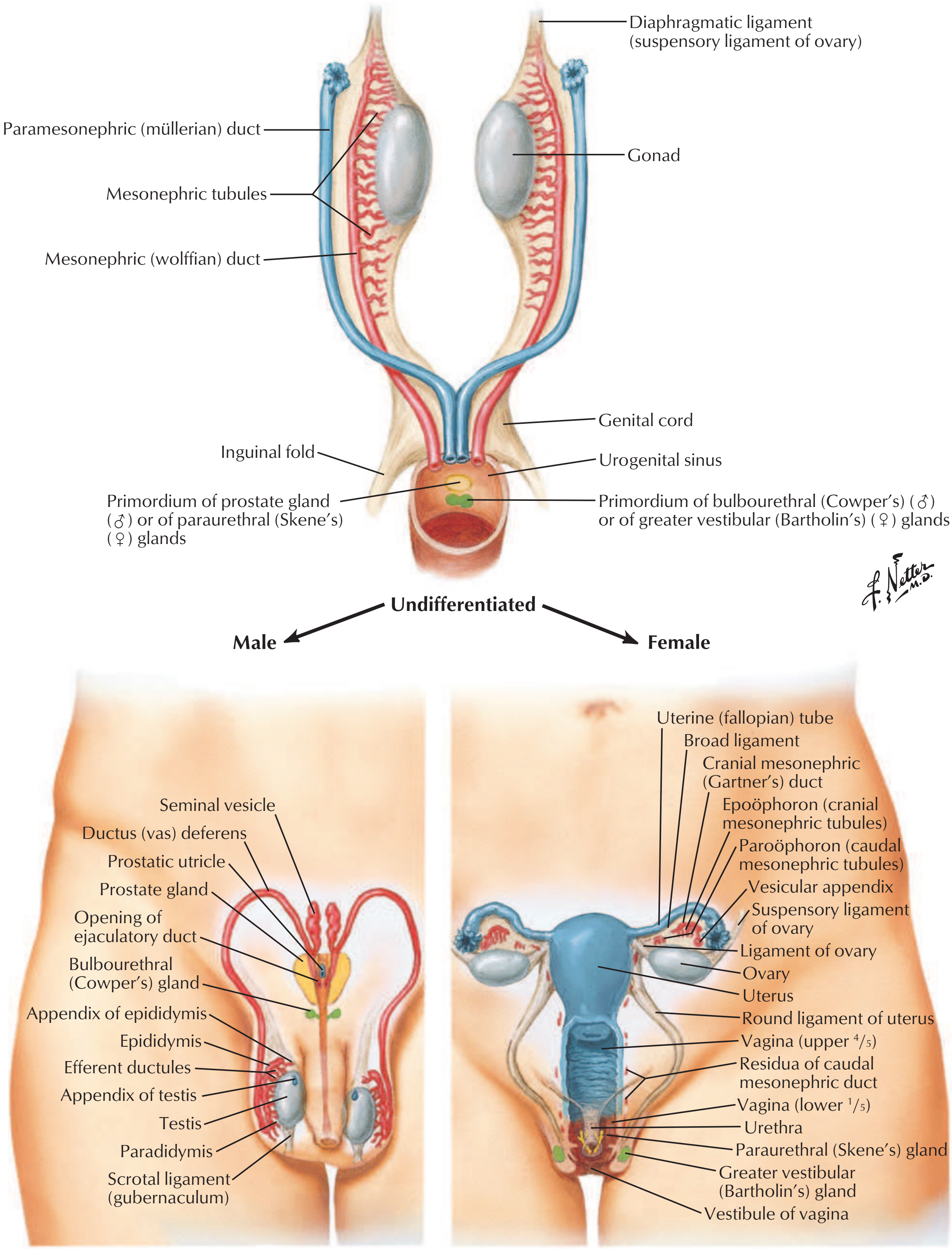

Pampiniform plexus
Epididymis
Testicle
Hydrocele
Testicular artery
Mediastinum of testis

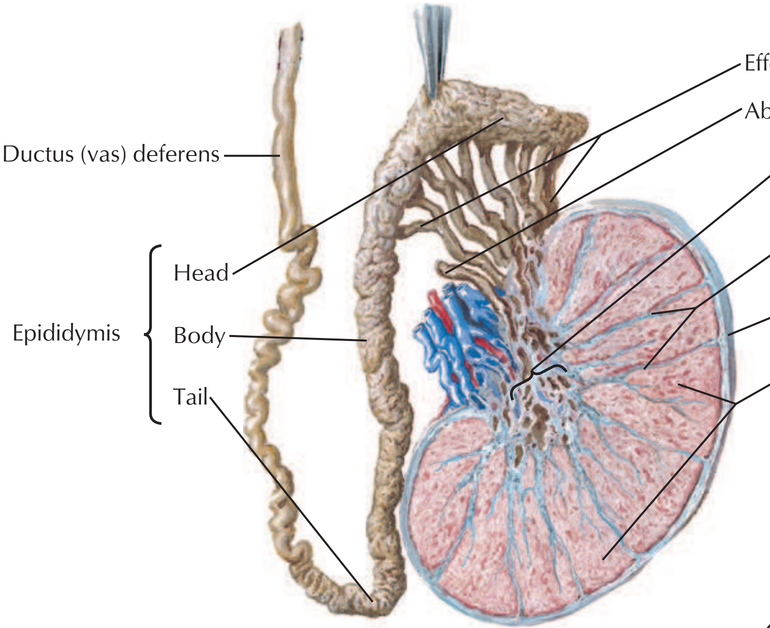
Homologues of External Genitalia

See also Plate 358

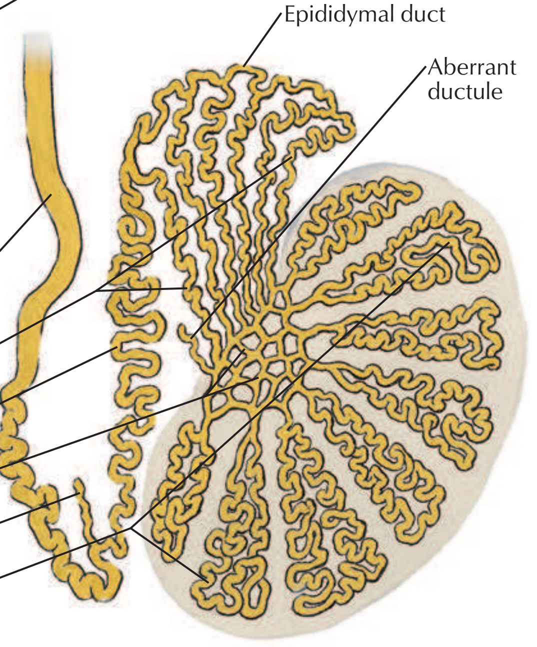

Undifferentiated
Glans area
Epithelial tag
Urogenital fold
Urogenital groove
Lateral part of tubercle
Anal tubercle
Anal pit
Genital tubercle
Male
Female
45–50 mm (~10 weeks)
45–50 mm (~10 weeks)
Glans
Epithelial tag
Coronal sulcus
Site of future origin of prepuce
Urethral fold
Urogenital groove
Lateral tubercle (shaft or corpus)
Labioscrotal swelling
Urethral folds partly fused (urethral raphe)
Anal tubercle
Anus
External urethral orifice
Glans penis
Prepuce
Fully developed
Body (shaft) of penis
Raphe of penis
Scrotum
Body of clitoris
Prepuce
Glans of clitoris
External urethral orifice
Labium minus
Labium majus
Vaginal orifice
Posterior commissure
Fully developed
Perineal raphe
Perianal tissues (including external anal sphincter muscle)
F. Netter M.D.

Homologues of Internal Genitalia

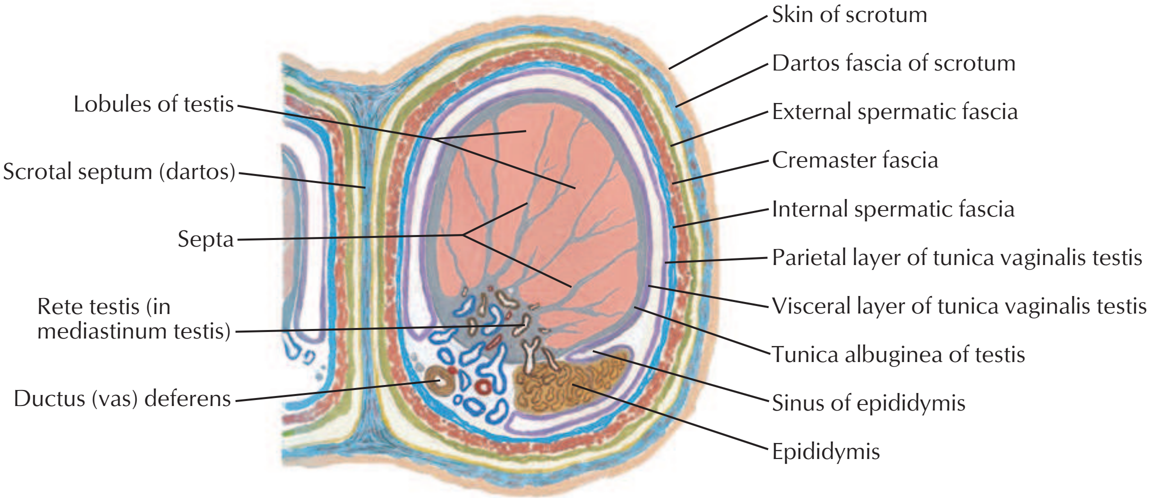

Diaphragmatic ligament (suspensory ligament of ovary)
Paramesonephric (müllerian) duct
Gonad
Mesonephric tubules
Mesonephric (wolffian) duct
Genital cord
Inguinal fold
Urogenital sinus
Primordium of prostate gland (♂) or of paraurethral (Skene's) (♀) glands
Primordium of bulbourethral (Cowper's) (♂) or of greater vestibular (Bartholin's) (♀) glands
F. Netter M.D.
Undifferentiated
Male
Female
Seminal vesicle
Ductus (vas) deferens
Prostatic utricle
Prostate gland
Opening of ejaculatory duct
Bulbourethral (Cowper's) gland
Appendix of epididymis
Epididymis
Efferent ductules
Appendix of testis
Testis
Paradidymis
Scrotal ligament (gubernaculum)
Uterine (fallopian) tube
Broad ligament
Cranial mesonephric (Gartner's) duct
Epoöphoron (cranial mesonephric tubules)
Paroöphoron (caudal mesonephric tubules)
Vesicular appendix
Suspensory ligament of ovary
Ligament of ovary
Ovary
Uterus
Round ligament of uterus
Vagina (upper $^{4}/_{5}$)
Residua of caudal mesonephric duct
Vagina (lower $^{1}/_{5}$)
Urethra
Paraurethral (Skene's) gland
Greater vestibular (Bartholin's) gland
Vestibule of vagina


Efferent ductules
Aberrant ductule (vestigial mesonephric tubule)
Ductus (vas) deferens
Area of rete testis (in mediastinum testis)
Septa
Head
Tunica albuginea
Epididymis
Body
Lobules
Tail

Frontal section

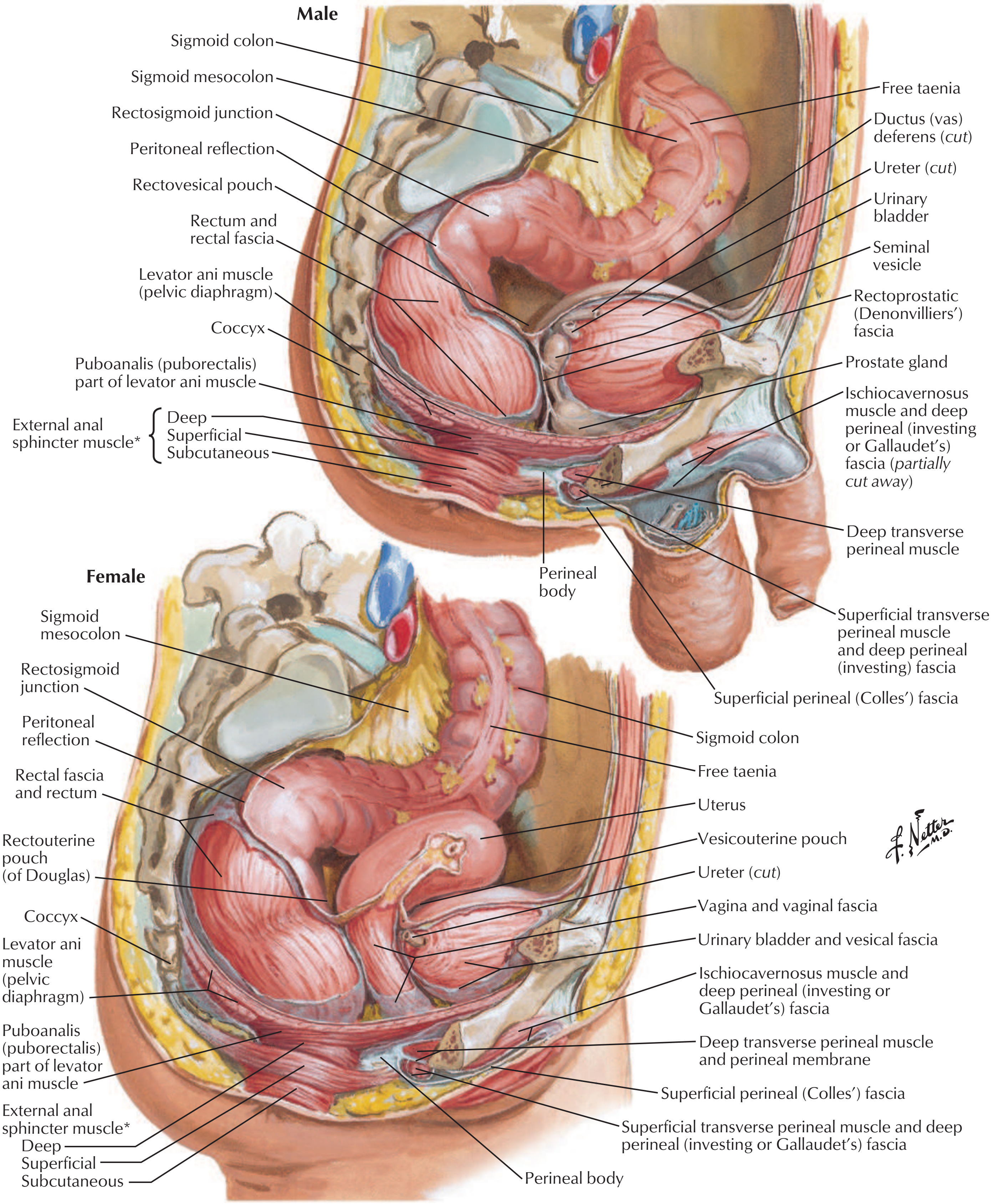

Epididymal duct
Aberrant ductule
Ductus (vas) deferens
Efferent ductules
Epididymal duct
Rete testis (in mediastinum testis)
Aberrant ductule
Convoluted seminiferous tubules

Schema


Skin of scrotum
Dartos fascia of scrotum
Lobules of testis
External spermatic fascia
Cremaster fascia
Scrotal septum (dartos)
Internal spermatic fascia
Septa
Parietal layer of tunica vaginalis testis
Visceral layer of tunica vaginalis testis
Rete testis (in mediastinum testis)
Tunica albuginea of testis
Ductus (vas) deferens
Sinus of epididymis
Epididymis

Cross section through scrotum and testis

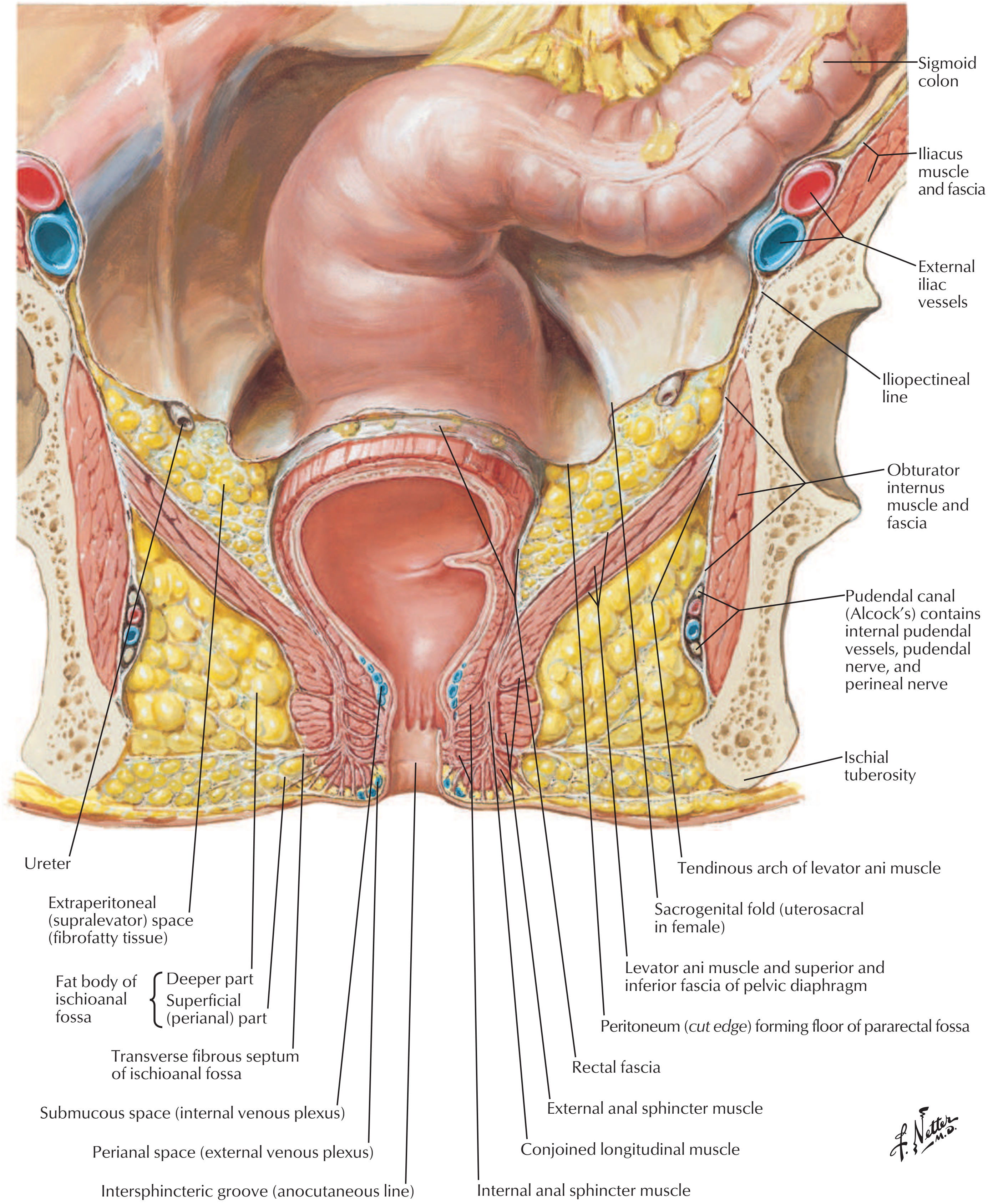
Rectum in Situ: Female and Male

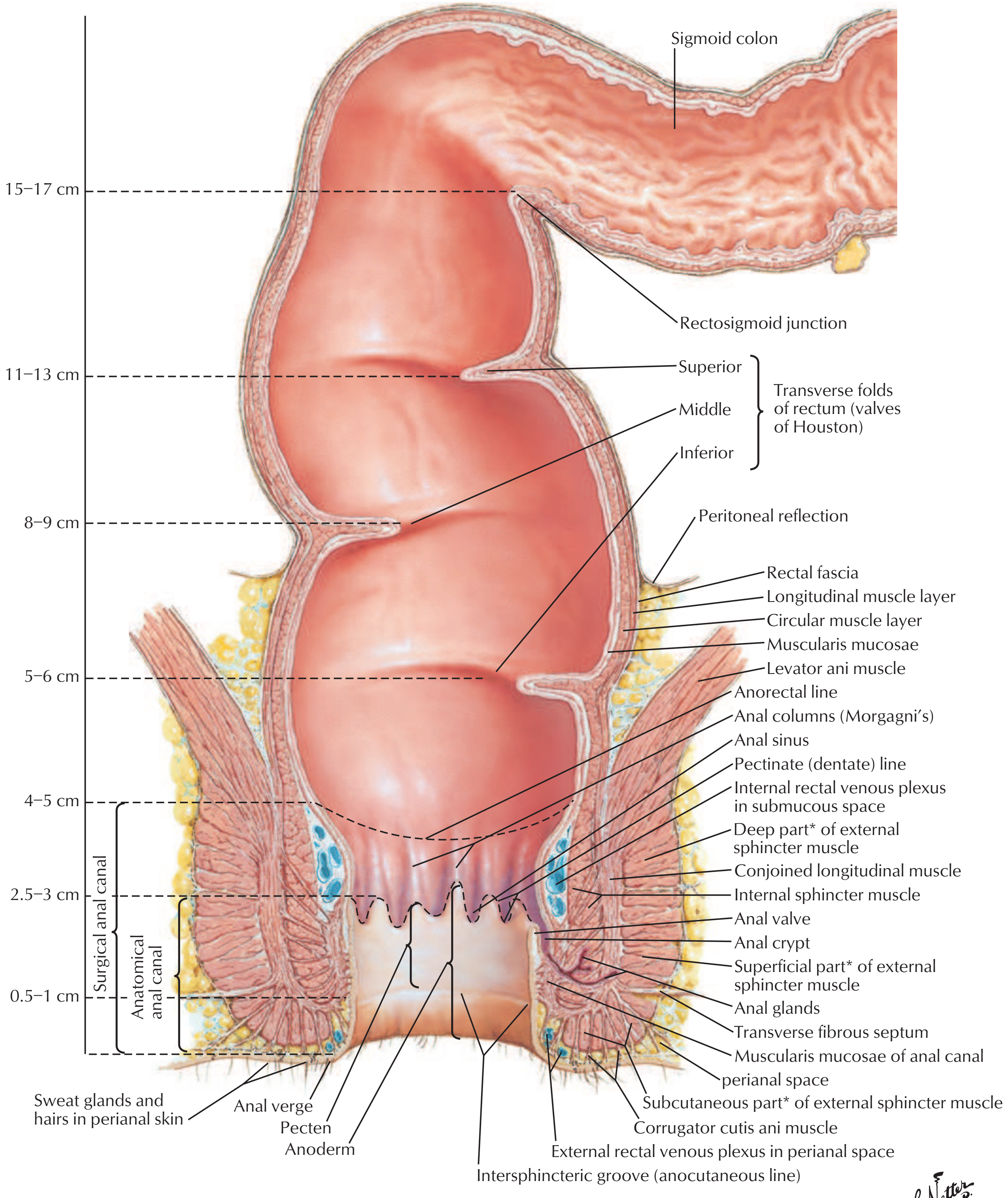

Male
Sigmoid colon
Sigmoid mesocolon
Rectosigmoid junction
Peritoneal reflection
Rectovesical pouch
Rectum and rectal fascia
Levator ani muscle (pelvic diaphragm)
Coccyx
Puboanalis (puborectalis) part of levator ani muscle
External anal sphincter muscle*
Deep
Superficial
Subcutaneous
Free taenia
Ductus (vas) deferens (*cut*)
Ureter (*cut*)
Urinary bladder
Seminal vesicle
Rectoprostatic (Denonvilliers') fascia
Prostate gland
Ischiocavernosus muscle and deep perineal (investing or Gallaudet's) fascia (*partially cut away*)
Deep transverse perineal muscle
Perineal body
Superficial transverse perineal muscle and deep perineal (investing) fascia
Superficial perineal (Colles') fascia
Female
Sigmoid mesocolon
Rectosigmoid junction
Peritoneal reflection
Rectal fascia and rectum
Rectouterine pouch (of Douglas)
Coccyx
Levator ani muscle (pelvic diaphragm)
Puboanalis (puborectalis) part of levator ani muscle
External anal sphincter muscle*
Deep
Superficial
Subcutaneous
Sigmoid colon
Free taenia
Uterus
Vesicouterine pouch
Ureter (*cut*)
Vagina and vaginal fascia
Urinary bladder and vesical fascia
Ischiocavernosus muscle and deep perineal (investing or Gallaudet's) fascia
Deep transverse perineal muscle and perineal membrane
Superficial perineal (Colles') fascia
Superficial transverse perineal muscle and deep perineal (investing or Gallaudet's) fascia
Perineal body
F. Netter M.D.

*Parts variable and often indistinct

Ischioanal Fossae

See also **Plate 392**

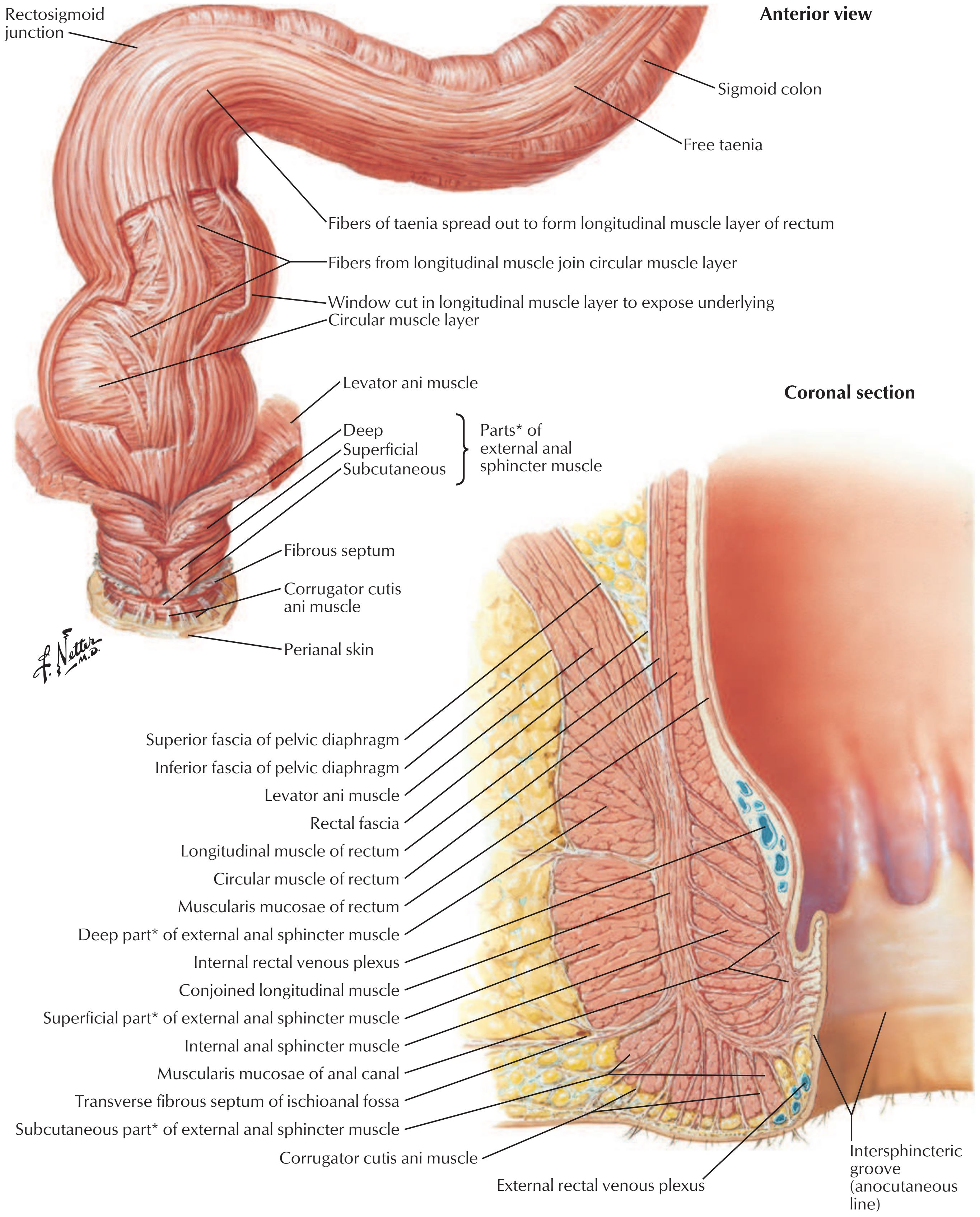

Sigmoid colon
Iliacus muscle and fascia
External iliac vessels
Iliopectineal line
Obturator internus muscle and fascia
Pudendal canal (Alcock's) contains internal pudendal vessels, pudendal nerve, and perineal nerve
Ischial tuberosity
Ureter
Tendinous arch of levator ani muscle
Extraperitoneal (supralevator) space (fibrofatty tissue)
Sacrogenital fold (uterosacral in female)
Fat body of ischioanal fossa
Deeper part
Superficial (perianal) part
Levator ani muscle and superior and inferior fascia of pelvic diaphragm
Peritoneum (*cut edge*) forming floor of pararectal fossa
Transverse fibrous septum of ischioanal fossa
Rectal fascia
Submucous space (internal venous plexus)
External anal sphincter muscle
Perianal space (external venous plexus)
Conjoined longitudinal muscle
Intersphincteric groove (anocutaneous line)
Internal anal sphincter muscle


Sigmoid colon
15–17 cm
Rectosigmoid junction
11–13 cm
Superior
Middle
Inferior
Transverse folds of rectum (valves of Houston)
8–9 cm
Peritoneal reflection
Rectal fascia
Longitudinal muscle layer
Circular muscle layer
Muscularis mucosae
Levator ani muscle
5–6 cm
Anorectal line
Anal columns (Morgagni's)
Anal sinus
Pectinate (dentate) line
4–5 cm
Internal rectal venous plexus in submucous space
Deep part* of external sphincter muscle
Conjoined longitudinal muscle
2.5–3 cm
Internal sphincter muscle
Anal valve
Anal crypt
Superficial part* of external sphincter muscle
Surgical anal canal
Anatomical anal canal
0.5–1 cm
Anal glands
Transverse fibrous septum
Muscularis mucosae of anal canal
perianal space
Subcutaneous part* of external sphincter muscle
Corrugator cutis ani muscle
External rectal venous plexus in perianal space
Intersphincteric groove (anocutaneous line)
Sweat glands and hairs in perianal skin
Anal verge
Pecten
Anoderm
F. Netter M.D.

*Parts variable and often indistinct

Anorectal Musculature

See also **Plate 381**

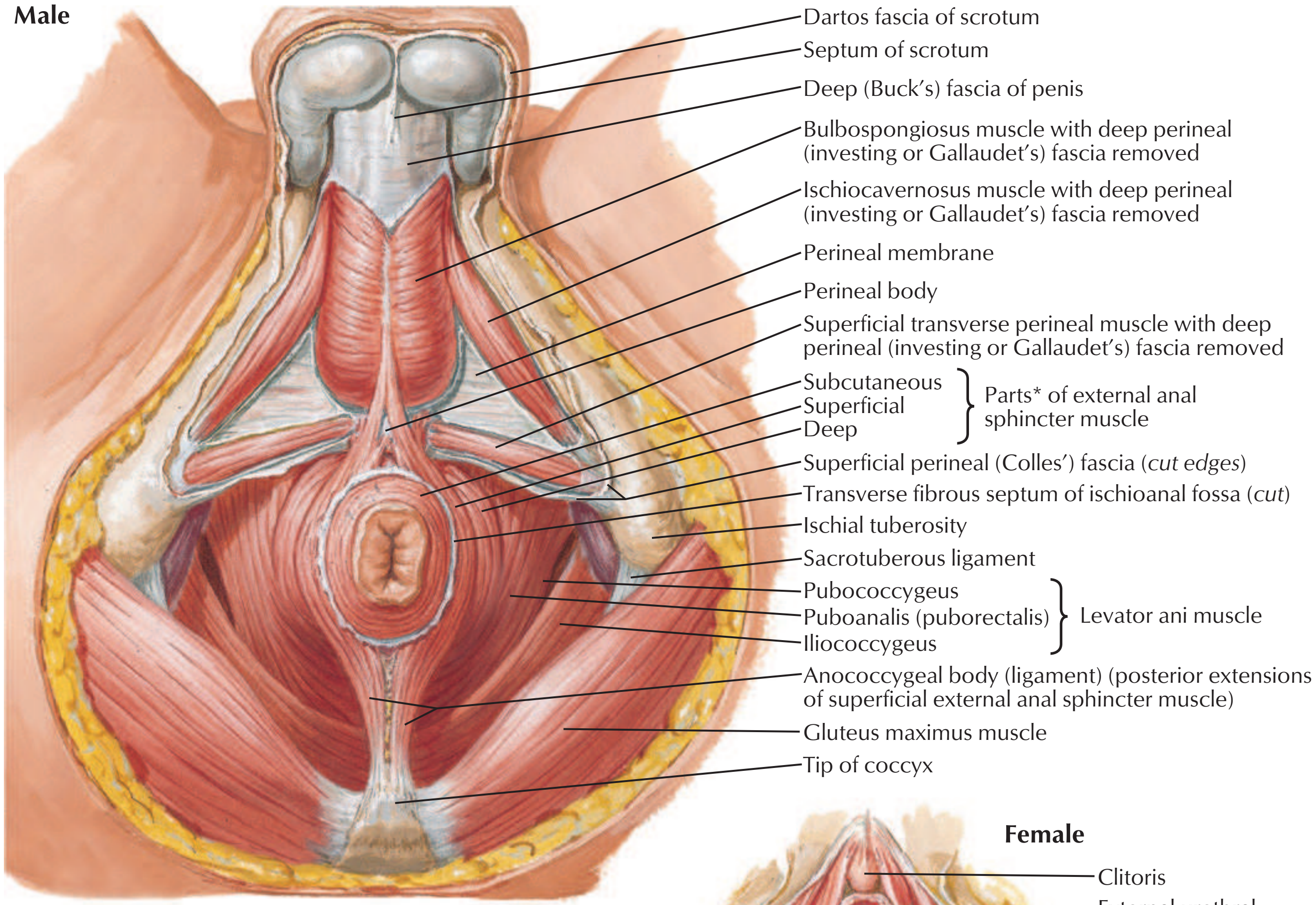

Anterior view
Rectosigmoid junction
Sigmoid colon
Free taenia
Fibers of taenia spread out to form longitudinal muscle layer of rectum
Fibers from longitudinal muscle join circular muscle layer
Window cut in longitudinal muscle layer to expose underlying
Circular muscle layer
Levator ani muscle
Deep
Superficial
Subcutaneous
Parts* of external anal sphincter muscle
Fibrous septum
Corrugator cutis ani muscle
Perianal skin
Coronal section
Superior fascia of pelvic diaphragm
Inferior fascia of pelvic diaphragm
Levator ani muscle
Rectal fascia
Longitudinal muscle of rectum
Circular muscle of rectum
Muscularis mucosae of rectum
Deep part* of external anal sphincter muscle
Internal rectal venous plexus
Conjoined longitudinal muscle
Superficial part* of external anal sphincter muscle
Internal anal sphincter muscle
Muscularis mucosae of anal canal
Transverse fibrous septum of ischioanal fossa
Subcutaneous part* of external anal sphincter muscle
Corrugator cutis ani muscle
External rectal venous plexus
Intersphincteric groove (anocutaneous line)

*Parts variable and often indistinct

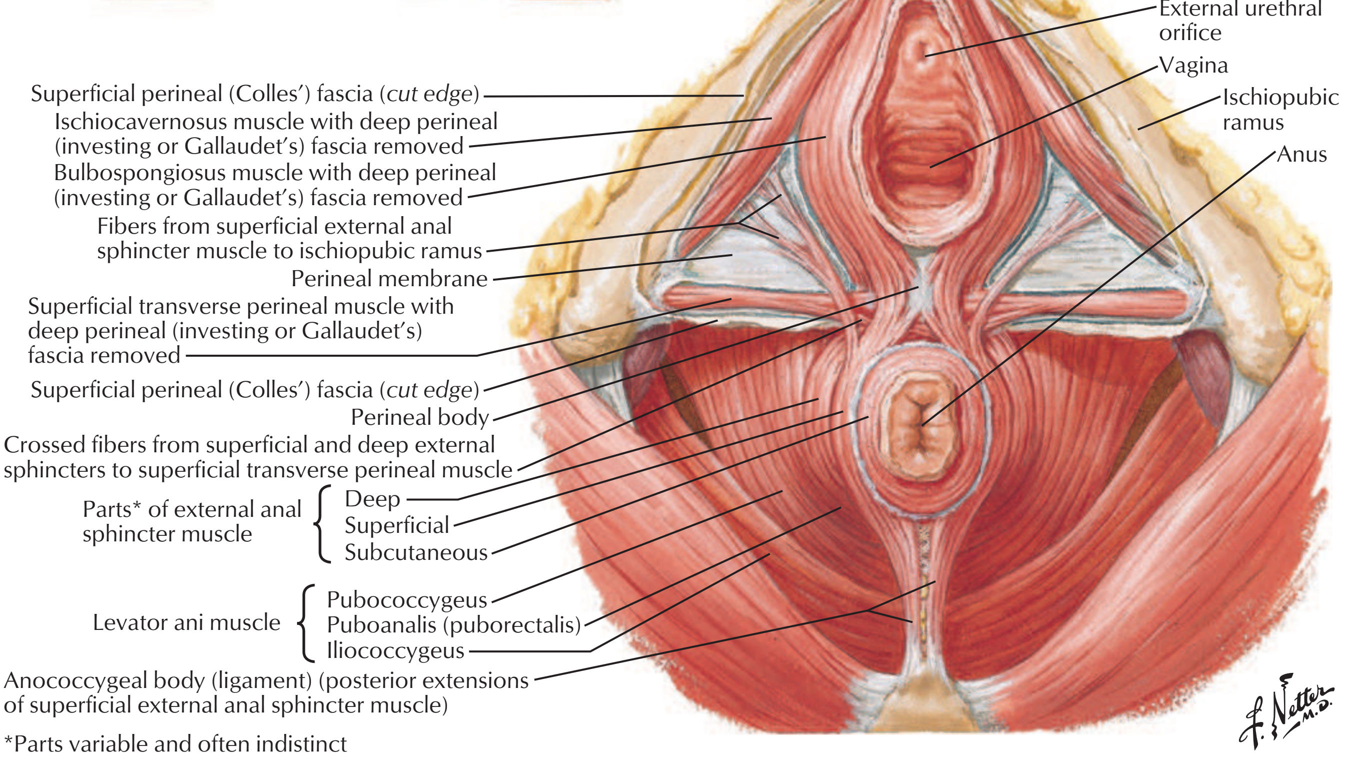
External Anal Sphincter Muscle: Perineal Views

See also Plates 360, 365

Male


Dartos fascia of scrotum
Septum of scrotum
Deep (Buck's) fascia of penis
Bulbospongiosus muscle with deep perineal (investing or Gallaudet's) fascia removed
Ischiocavernosus muscle with deep perineal (investing or Gallaudet's) fascia removed
Perineal membrane
Perineal body
Superficial transverse perineal muscle with deep perineal (investing or Gallaudet's) fascia removed
Subcutaneous
Superficial
Deep
Parts* of external anal sphincter muscle
Superficial perineal (Colles') fascia (*cut edges*)
Transverse fibrous septum of ischioanal fossa (*cut*)
Ischial tuberosity
Sacrotuberous ligament
Pubococcygeus
Puboanalis (puborectalis)
Iliococcygeus
Levator ani muscle
Anococcygeal body (ligament) (posterior extensions of superficial external anal sphincter muscle)
Gluteus maximus muscle
Tip of coccyx

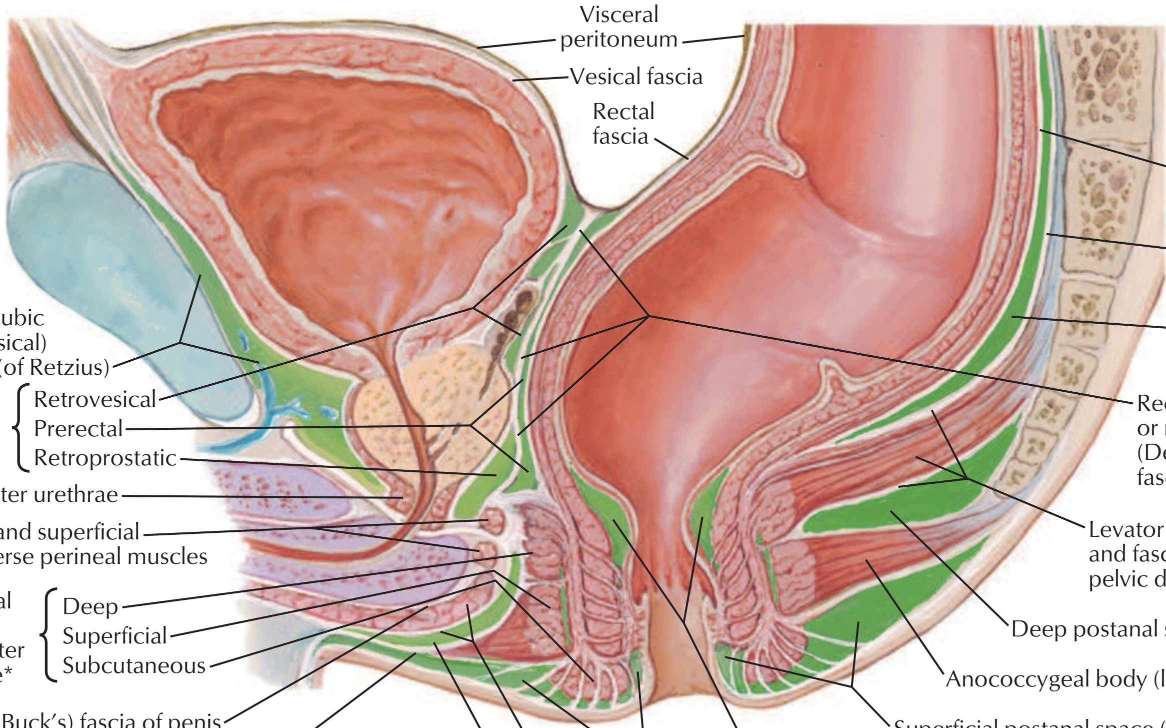
Female


Clitoris
External urethral orifice
Vagina
Ischiopubic ramus
Anus
Superficial perineal (Colles') fascia (*cut edge*)
Ischiocavernosus muscle with deep perineal (investing or Gallaudet's) fascia removed
Bulbospongiosus muscle with deep perineal (investing or Gallaudet's) fascia removed
Fibers from superficial external anal sphincter muscle to ischiopubic ramus
Perineal membrane
Superficial transverse perineal muscle with deep perineal (investing or Gallaudet's) fascia removed
Superficial perineal (Colles') fascia (*cut edge*)
Perineal body
Crossed fibers from superficial and deep external sphincters to superficial transverse perineal muscle
Parts* of external anal sphincter muscle
Deep
Superficial
Subcutaneous
Levator ani muscle
Pubococcygeus
Puboanalis (puborectalis)
Iliococcygeus
Anococcygeal body (ligament) (posterior extensions of superficial external anal sphincter muscle)
F. Netter M.D.

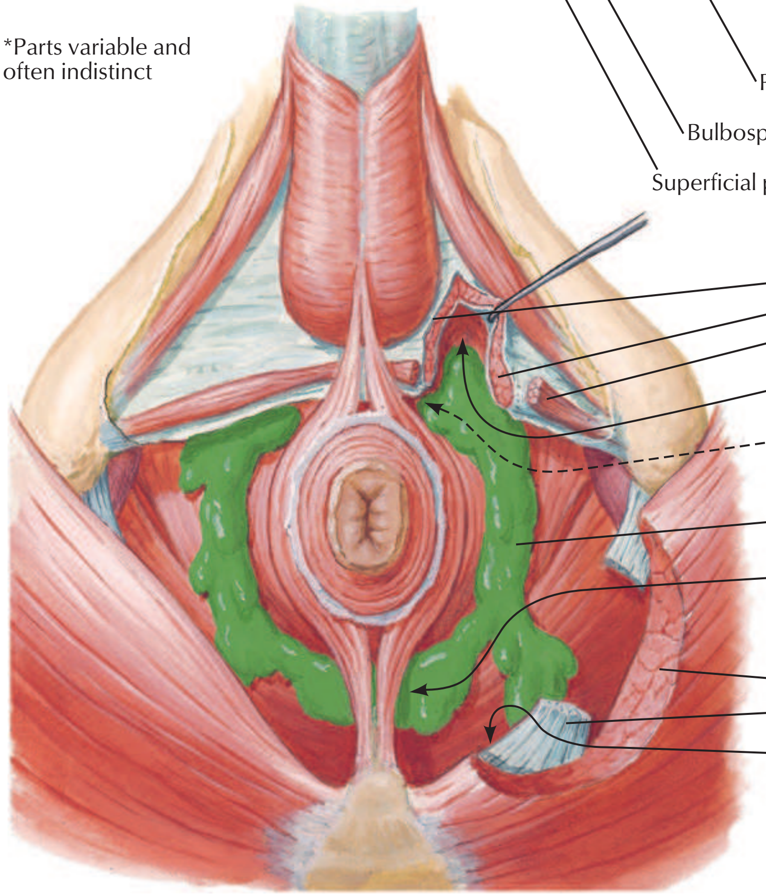
*Parts variable and often indistinct

Actual and Potential Perineopelvic Spaces

Sagittal section


Visceral peritoneum
Vesical fascia
Rectal fascia
Rectal fascia
Presacral fascia
Presacral space
Retropubic (prevesical) space (of Retzius)
Recto-vesical space
Retrovesical
Prerectal
Retroprostatic
Rectovesical or rectoprostatic (Denonvilliers') fascia (septum)
Sphincter urethrae
Levator ani muscle and fascia of pelvic diaphragm
Deep and superficial transverse perineal muscles
External anal sphincter muscle*
Deep
Superficial
Subcutaneous
Deep postanal space
Anococcygeal body (ligament)
Deep (Buck's) fascia of penis
Superficial perineal (Colles') fascia
Superficial postanal space (part of perianal space)
Submucous space
Perianal space
Bulbospongiosus muscle and deep perineal (Gallaudet's) fascia
Superficial perineal compartment (space or pouch)

*Parts variable and often indistinct

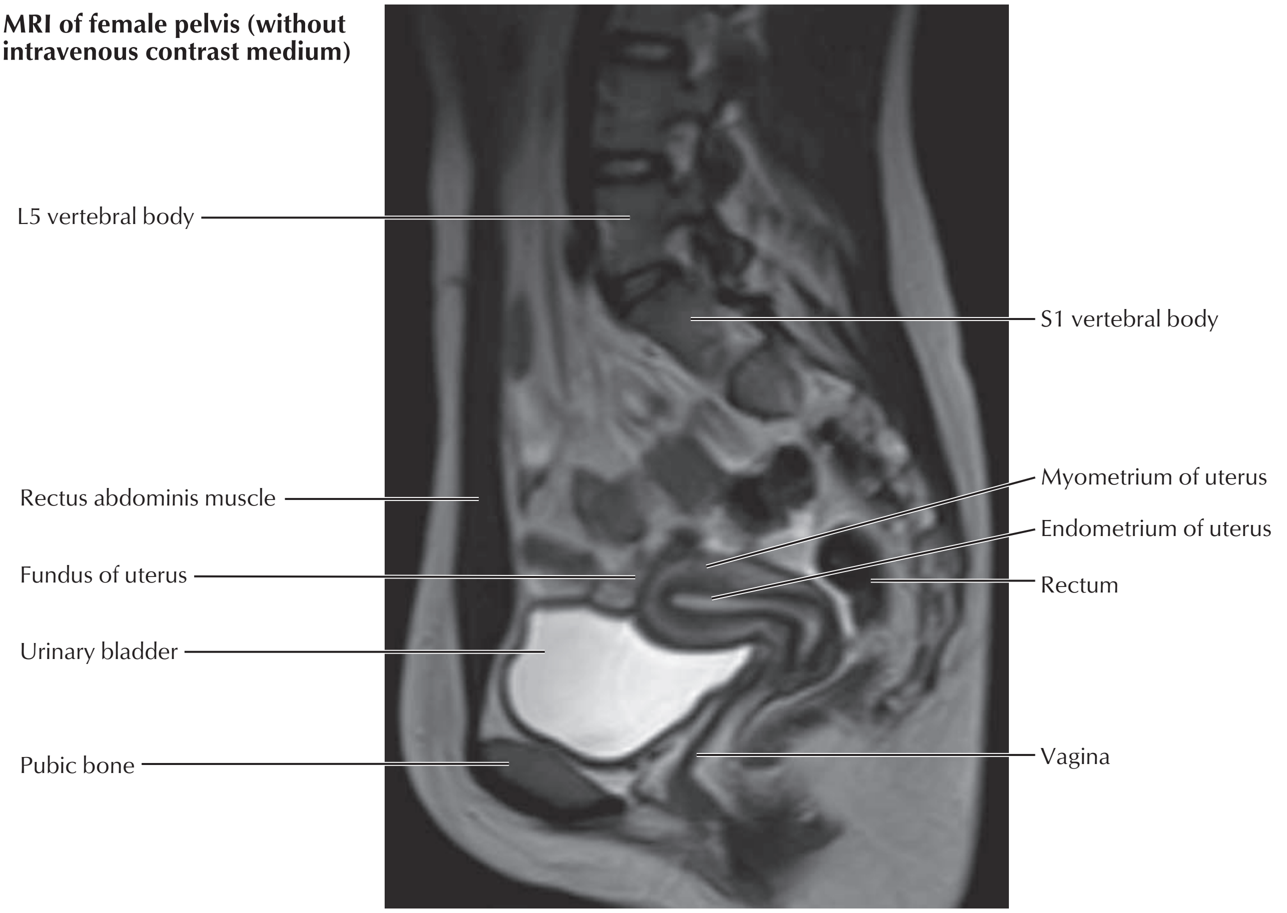

Perineal membrane,
Deep transverse perineal muscle, and
Superficial transverse perineal muscle (*cut away*) to expose
Anterior recess of ischioanal fossa
Preanal communication (inconstant) between right and left ischioanal fossae
Pus in ischioanal fossa
Posterior communication between right and left ischioanal fossae via deep postanal space deep to anococcygeal body (ligament)
Gluteus maximus muscle and
Sacrotuberous ligament (*cut*)
Posterior recess of ischioanal fossa

Perineal view

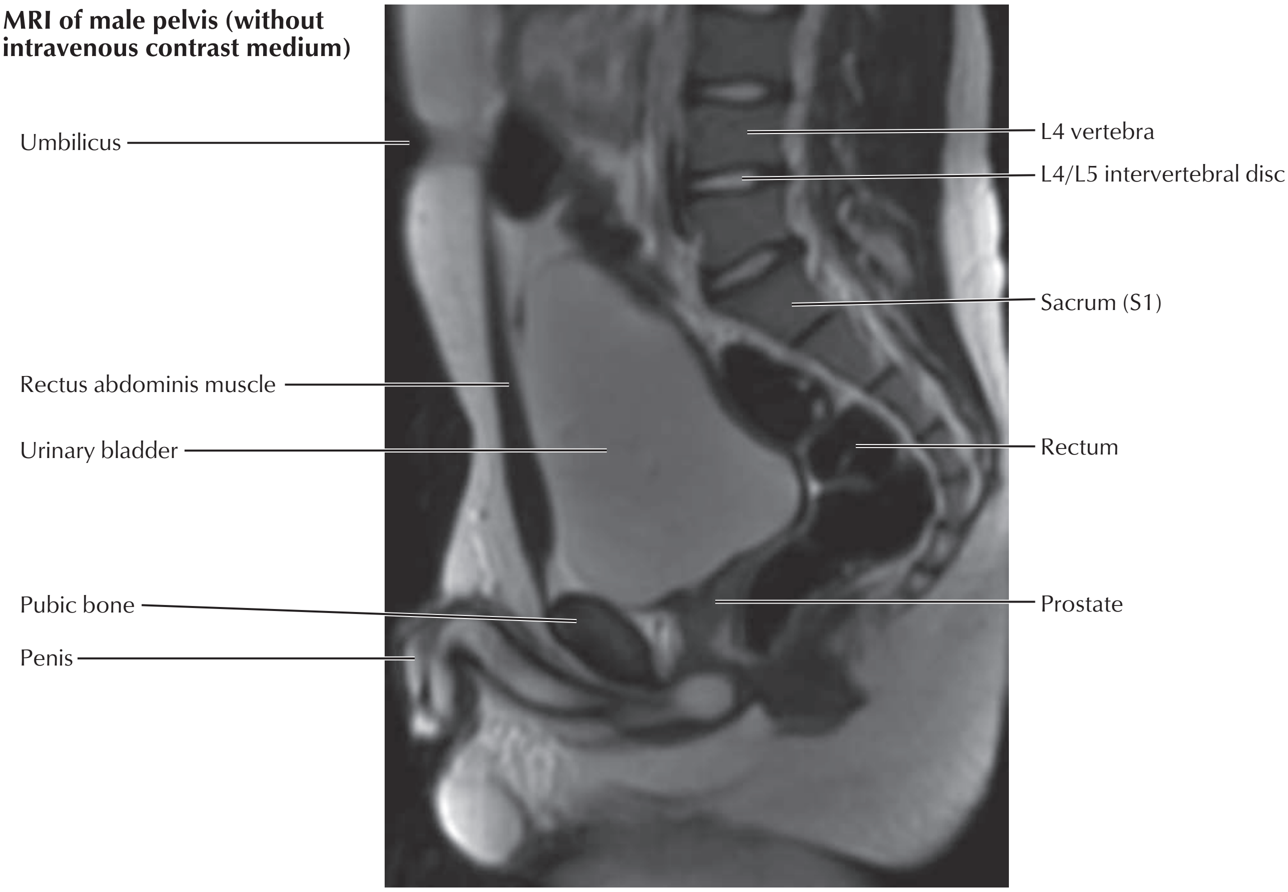
F. Netter M.D.
C. Machado M.D.

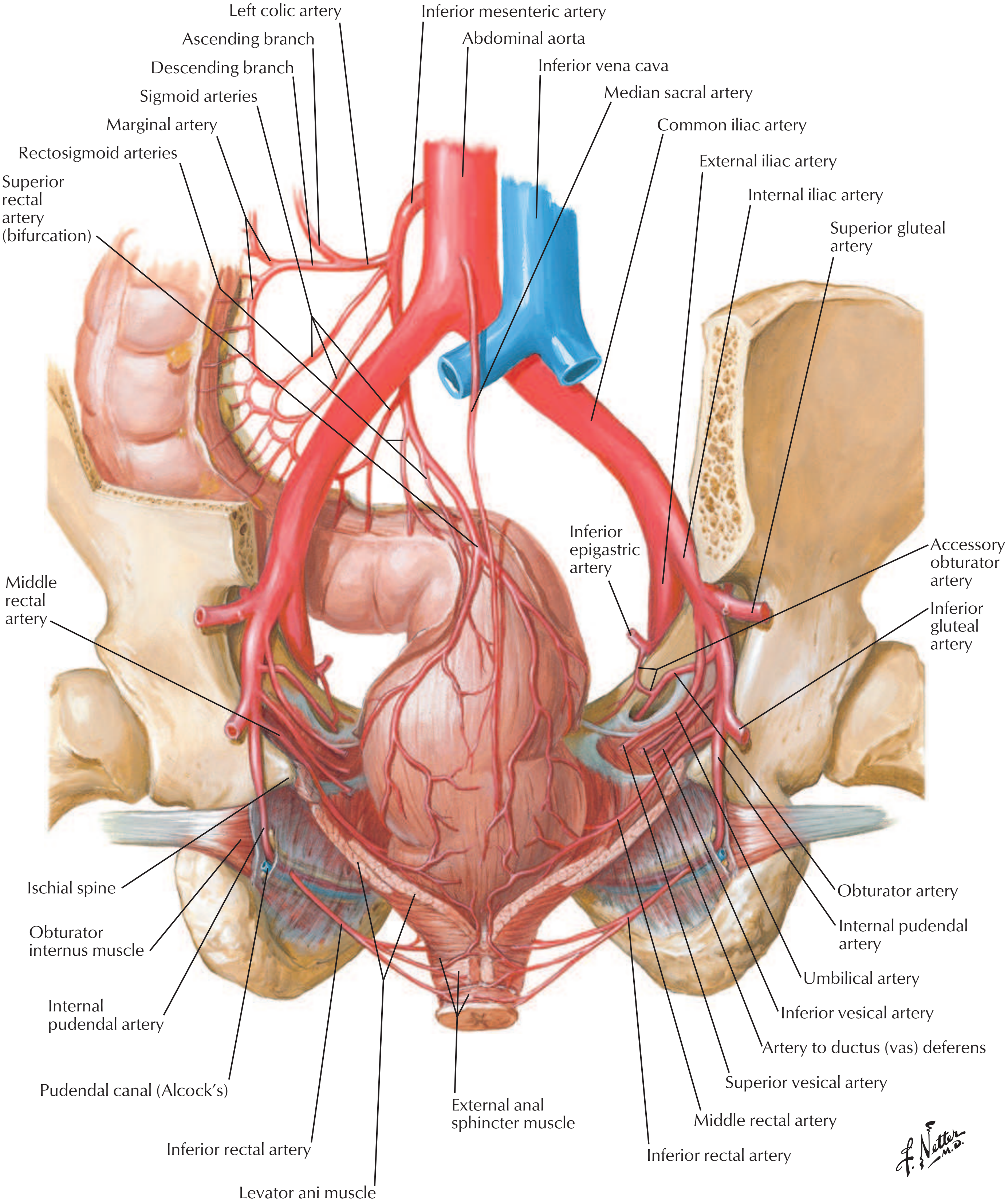
Spread of perineal abscess in perineal spaces

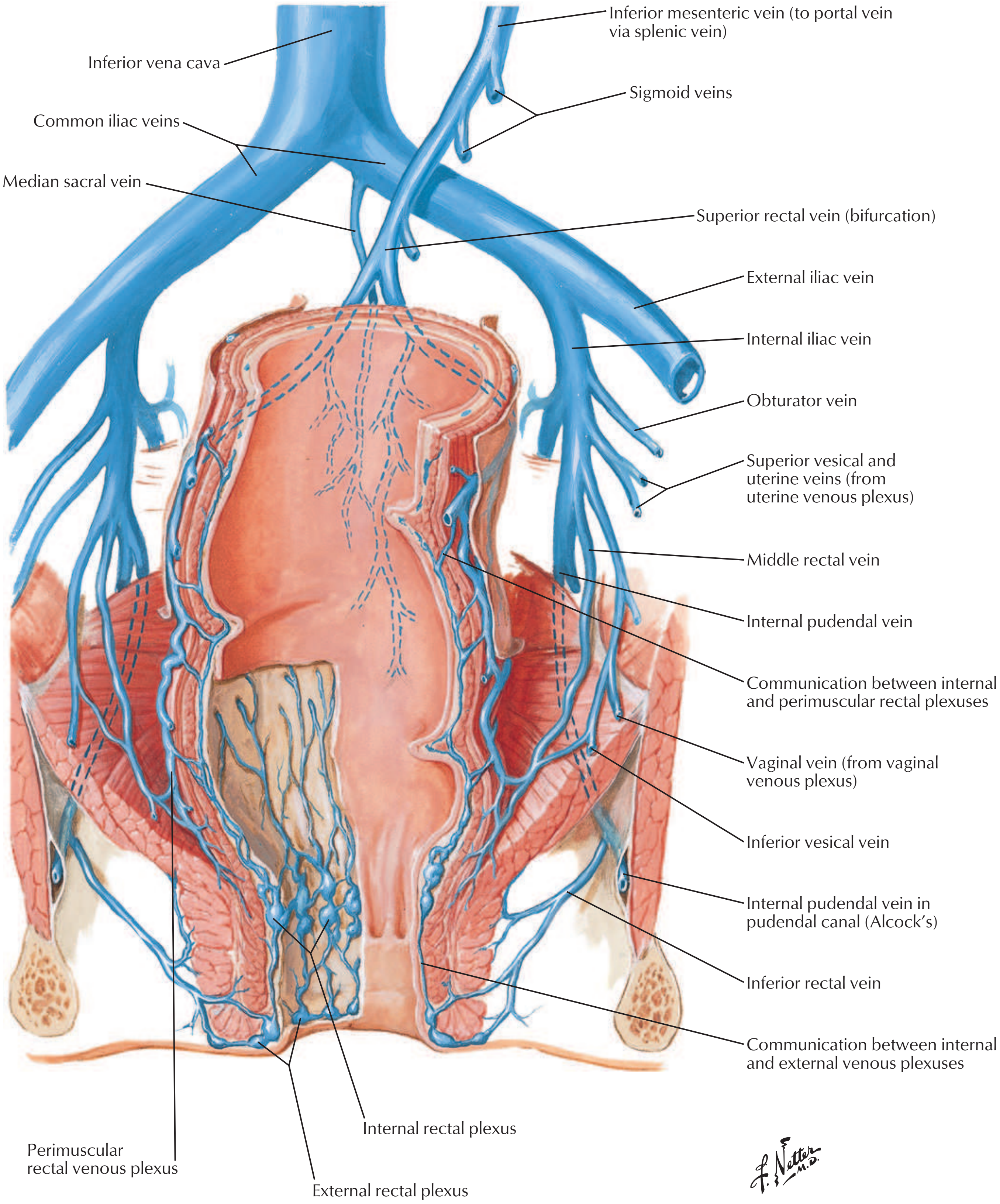
MRI of female pelvis (without intravenous contrast medium)


L5 vertebral body
S1 vertebral body
Rectus abdominis muscle
Myometrium of uterus
Endometrium of uterus
Fundus of uterus
Rectum
Urinary bladder
Pubic bone
Vagina

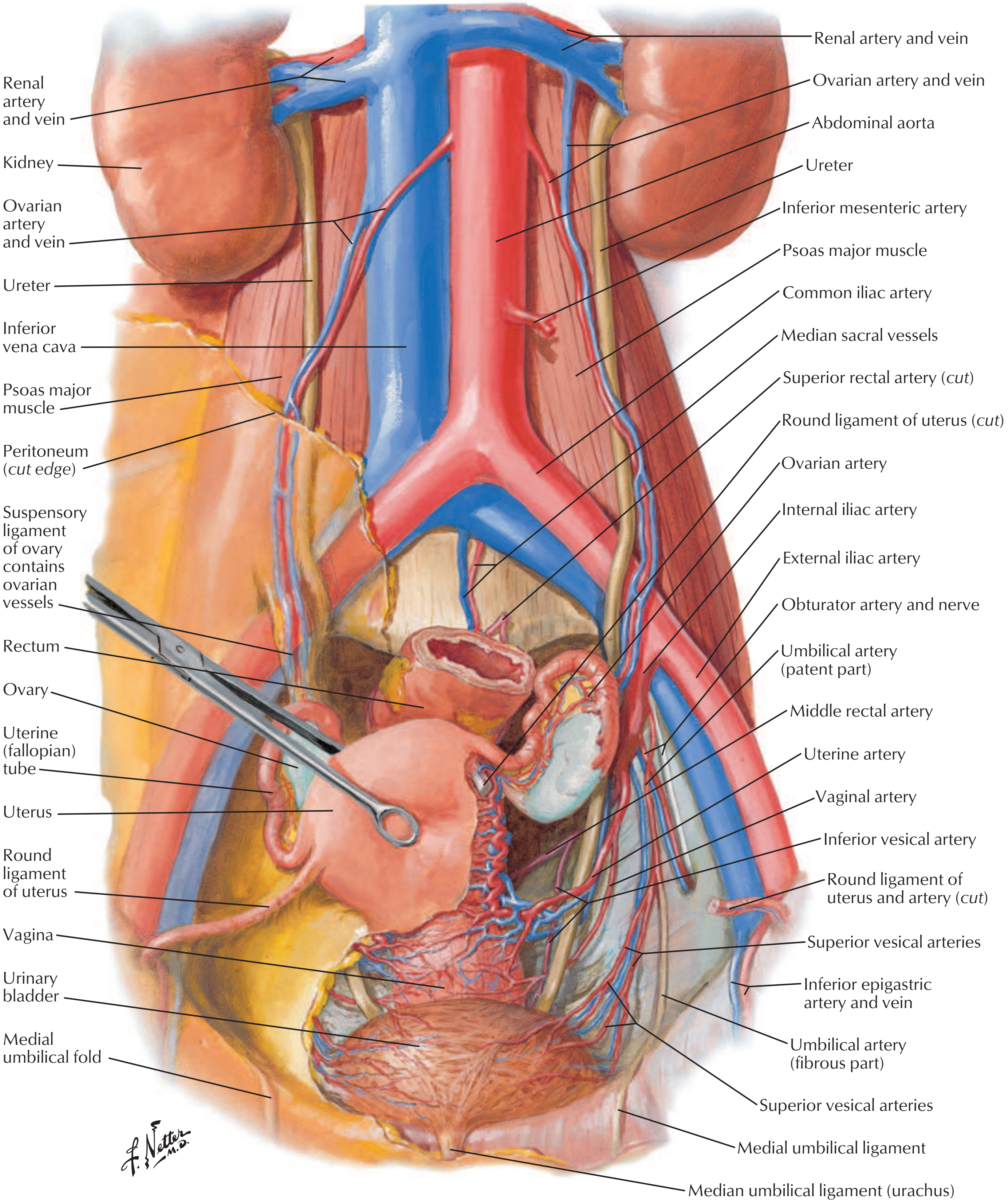
MRI of male pelvis (without intravenous contrast medium)

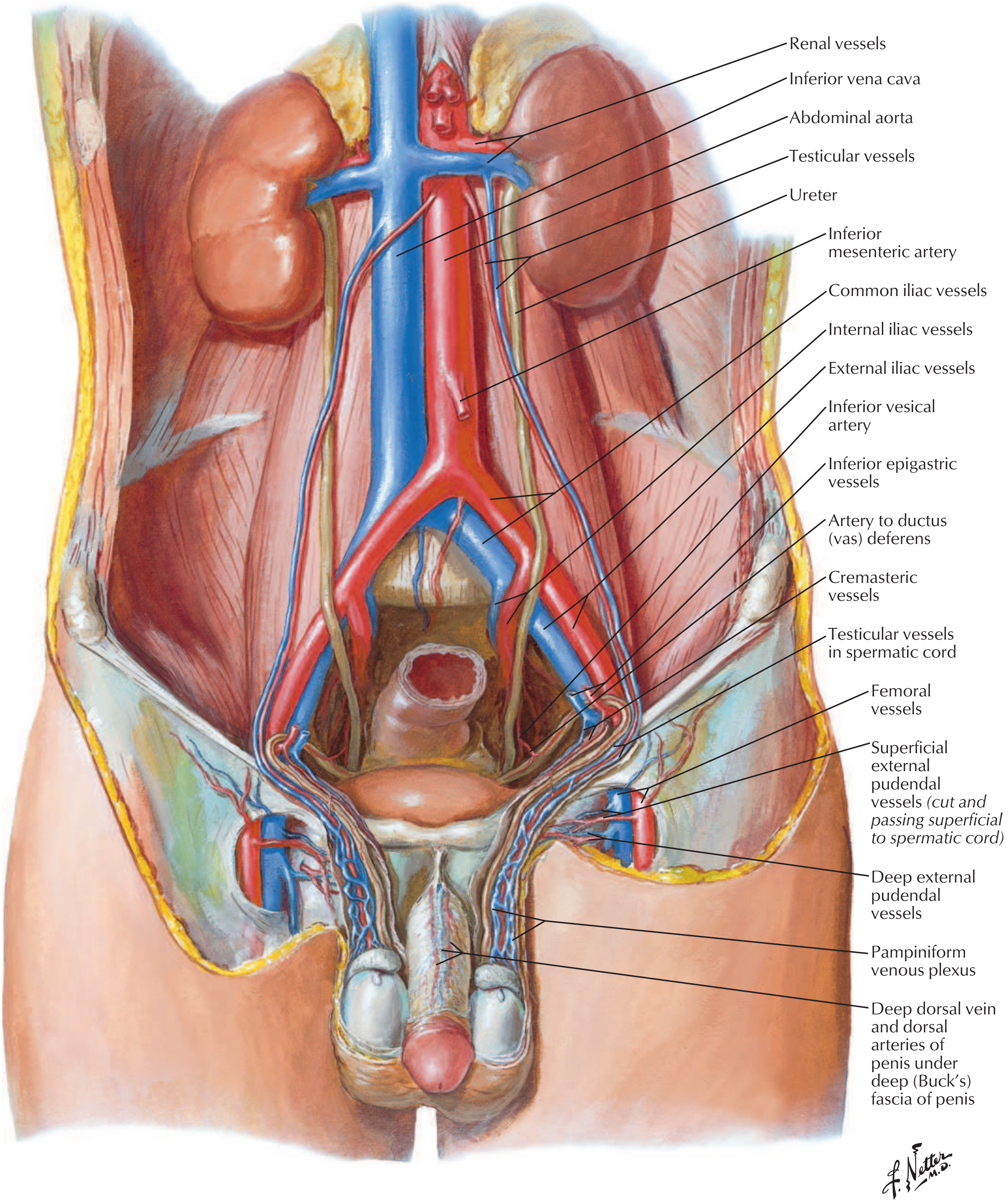

Umbilicus
L4 vertebra
L4/L5 intervertebral disc
Sacrum (S1)
Rectus abdominis muscle
Rectum
Urinary bladder
Pubic bone
Prostate
Penis


Left colic artery
Ascending branch
Descending branch
Sigmoid arteries
Marginal artery
Rectosigmoid arteries
Superior rectal artery (bifurcation)
Inferior mesenteric artery
Abdominal aorta
Inferior vena cava
Median sacral artery
Common iliac artery
External iliac artery
Internal iliac artery
Superior gluteal artery
Middle rectal artery
Inferior epigastric artery
Accessory obturator artery
Inferior gluteal artery
Ischial spine
Obturator internus muscle
Internal pudendal artery
Pudendal canal (Alcock's)
Inferior rectal artery
Levator ani muscle
External anal sphincter muscle
Obturator artery
Internal pudendal artery
Umbilical artery
Inferior vesical artery
Artery to ductus (vas) deferens
Superior vesical artery
Middle rectal artery
Inferior rectal artery

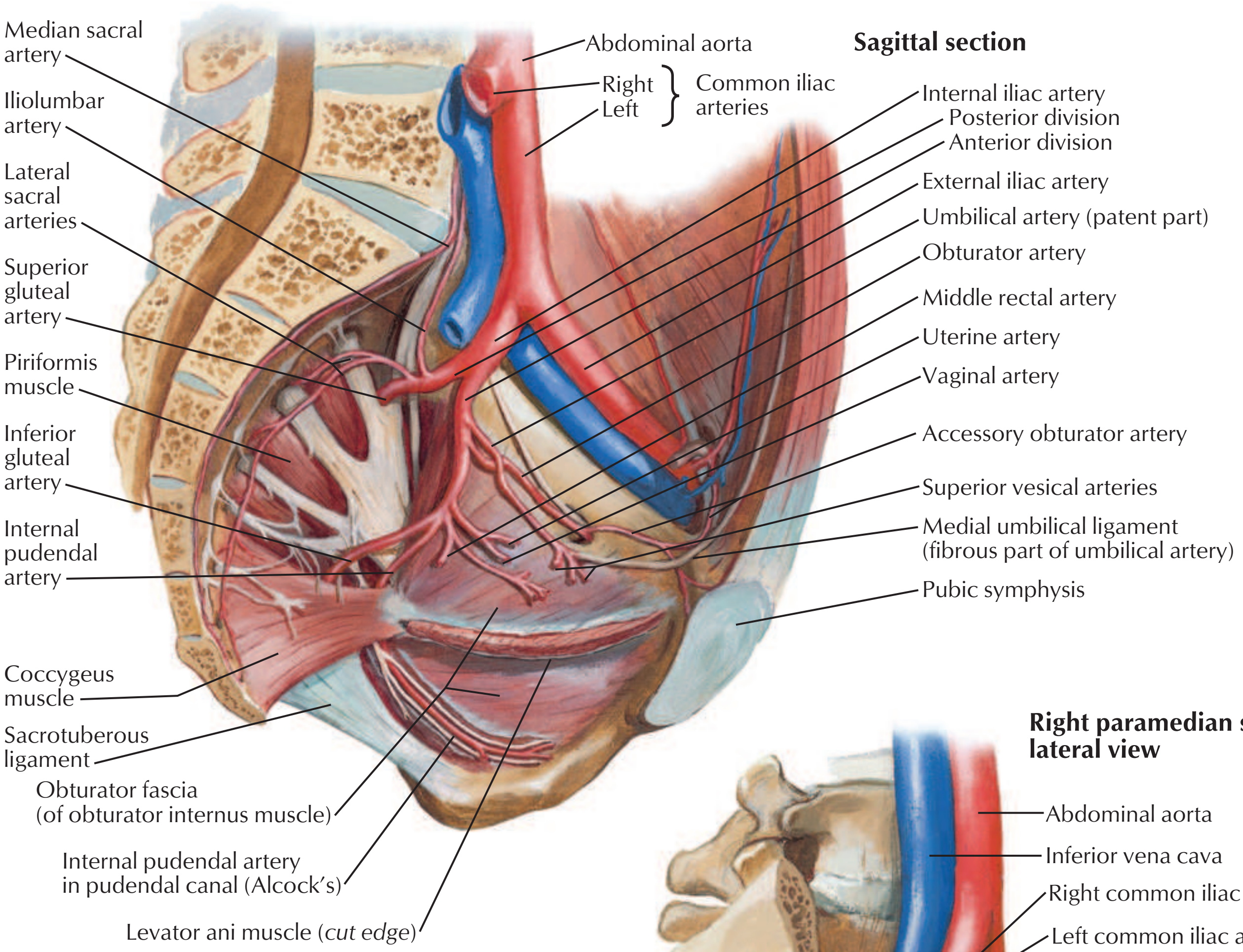

Inferior vena cava
Common iliac veins
Median sacral vein
Inferior mesenteric vein (to portal vein via splenic vein)
Sigmoid veins
Superior rectal vein (bifurcation)
External iliac vein
Internal iliac vein
Obturator vein
Superior vesical and uterine veins (from uterine venous plexus)
Middle rectal vein
Internal pudendal vein
Communication between internal and perimuscular rectal plexuses
Vaginal vein (from vaginal venous plexus)
Inferior vesical vein
Internal pudendal vein in pudendal canal (Alcock's)
Inferior rectal vein
Communication between internal and external venous plexuses
Internal rectal plexus
Perimuscular rectal venous plexus
External rectal plexus
F. Netter M.D.

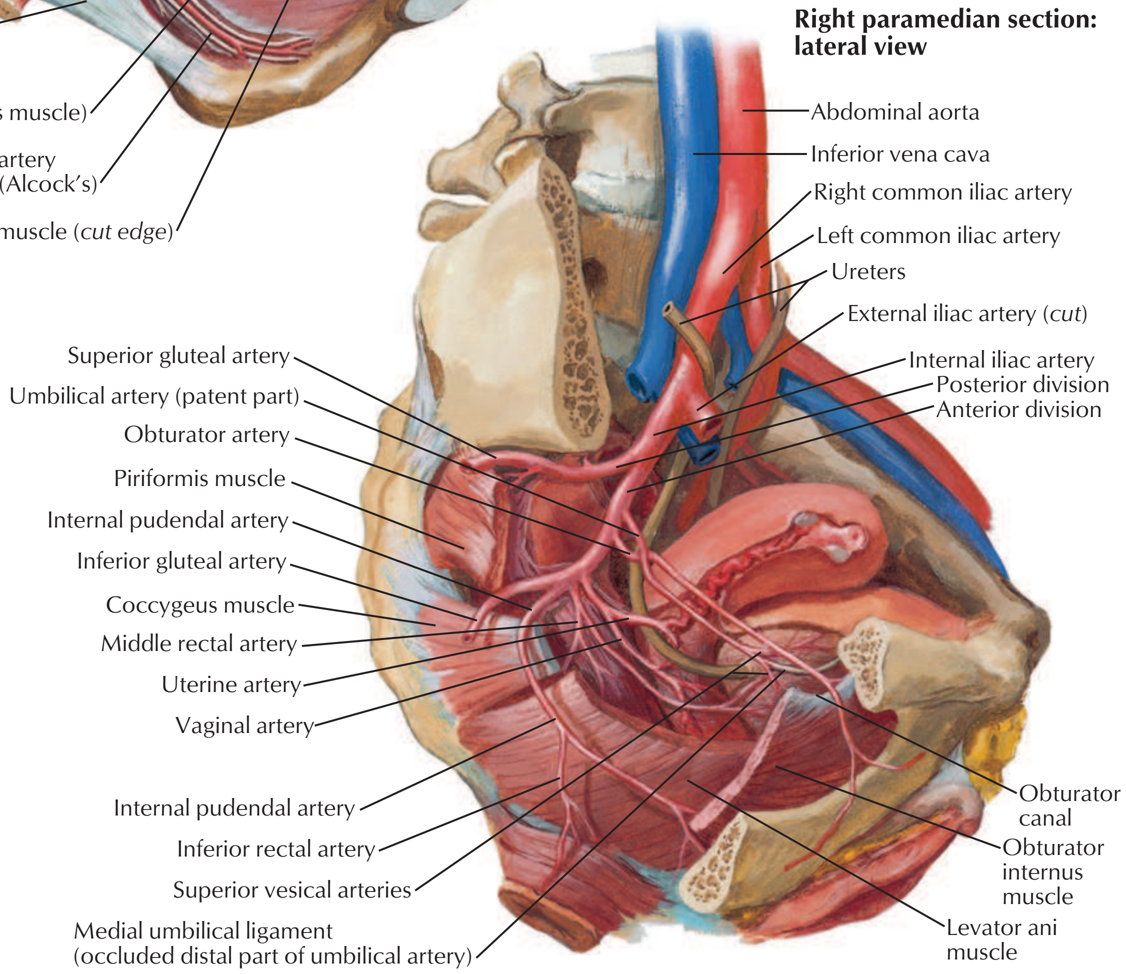
Arteries and Veins of Pelvic Organs: Female Anterior View


Renal artery and vein
Kidney
Ovarian artery and vein
Ureter
Inferior vena cava
Psoas major muscle
Peritoneum (*cut edge*)
Suspensory ligament of ovary contains ovarian vessels
Rectum
Ovary
Uterine (fallopian) tube
Uterus
Round ligament of uterus
Vagina
Urinary bladder
Medial umbilical fold
Renal artery and vein
Ovarian artery and vein
Abdominal aorta
Ureter
Inferior mesenteric artery
Psoas major muscle
Common iliac artery
Median sacral vessels
Superior rectal artery (*cut*)
Round ligament of uterus (*cut*)
Ovarian artery
Internal iliac artery
External iliac artery
Obturator artery and nerve
Umbilical artery (patent part)
Middle rectal artery
Uterine artery
Vaginal artery
Inferior vesical artery
Round ligament of uterus and artery (*cut*)
Superior vesical arteries
Inferior epigastric artery and vein
Umbilical artery (fibrous part)
Superior vesical arteries
Medial umbilical ligament
Median umbilical ligament (urachus)
F. Netter M.D.

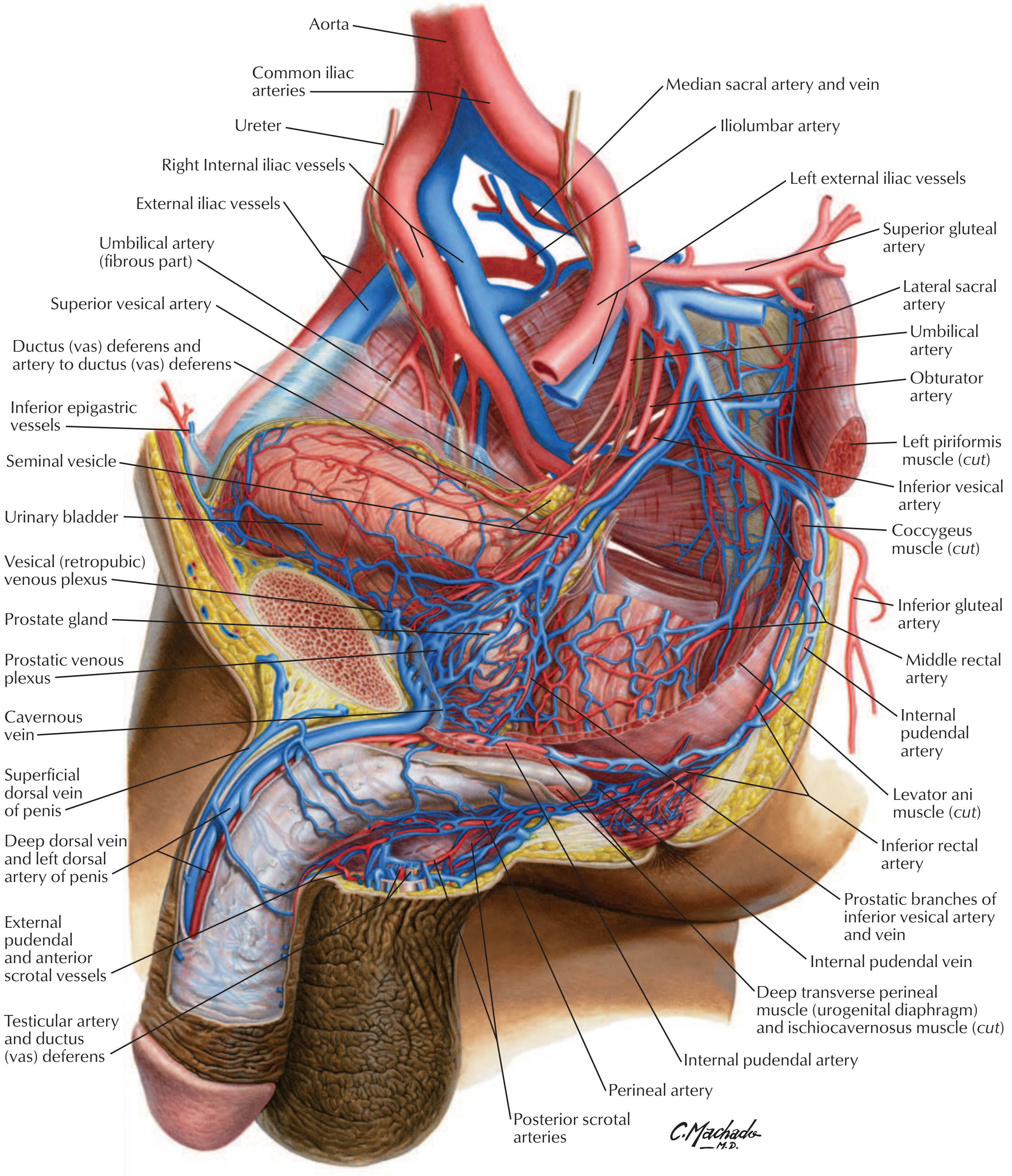

Renal vessels
Inferior vena cava
Abdominal aorta
Testicular vessels
Ureter
Inferior mesenteric artery
Common iliac vessels
Internal iliac vessels
External iliac vessels
Inferior vesical artery
Inferior epigastric vessels
Artery to ductus (vas) deferens
Cremasteric vessels
Testicular vessels in spermatic cord
Femoral vessels
Superficial external pudendal vessels *(cut and passing superficial to spermatic cord)*
Deep external pudendal vessels
Pampiniform venous plexus
Deep dorsal vein and dorsal arteries of penis under deep (Buck's) fascia of penis
F. Netter M.D.

Arteries of Pelvis: Female

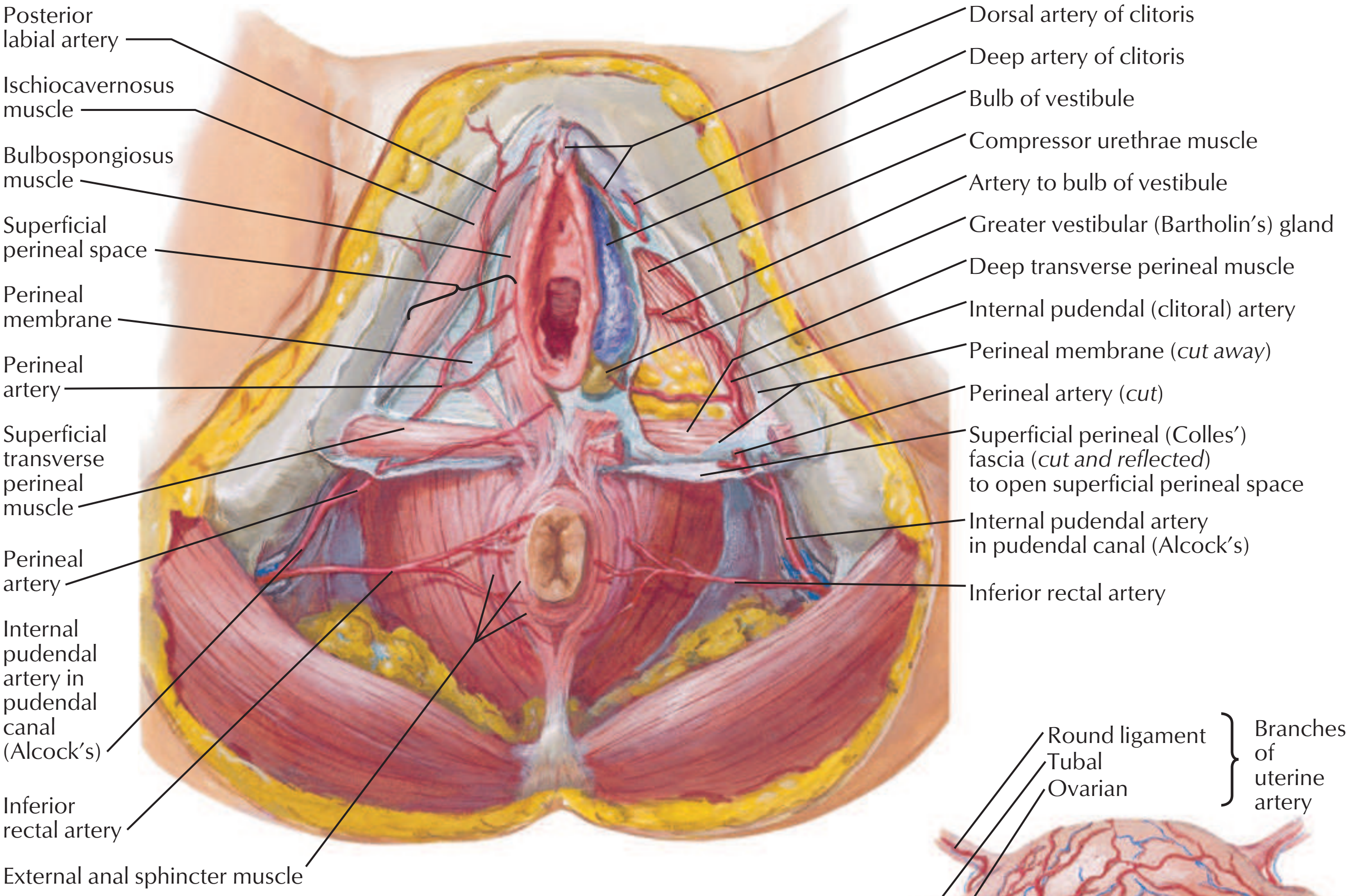

Sagittal section
Median sacral artery
Iliolumbar artery
Lateral sacral arteries
Superior gluteal artery
Piriformis muscle
Inferior gluteal artery
Internal pudendal artery
Coccygeus muscle
Sacrotuberous ligament
Obturator fascia (of obturator internus muscle)
Internal pudendal artery in pudendal canal (Alcock's)
Levator ani muscle (*cut edge*)
Abdominal aorta
Right
Left
Common iliac arteries
Internal iliac artery
Posterior division
Anterior division
External iliac artery
Umbilical artery (patent part)
Obturator artery
Middle rectal artery
Uterine artery
Vaginal artery
Accessory obturator artery
Superior vesical arteries
Medial umbilical ligament (fibrous part of umbilical artery)
Pubic symphysis


Right paramedian section: lateral view
Abdominal aorta
Inferior vena cava
Right common iliac artery
Left common iliac artery
Ureters
External iliac artery (*cut*)
Internal iliac artery
Posterior division
Anterior division
Superior gluteal artery
Umbilical artery (patent part)
Obturator artery
Piriformis muscle
Internal pudendal artery
Inferior gluteal artery
Coccygeus muscle
Middle rectal artery
Uterine artery
Vaginal artery
Internal pudendal artery
Inferior rectal artery
Superior vesical arteries
Medial umbilical ligament (occluded distal part of umbilical artery)
Obturator canal
Obturator internus muscle
Levator ani muscle

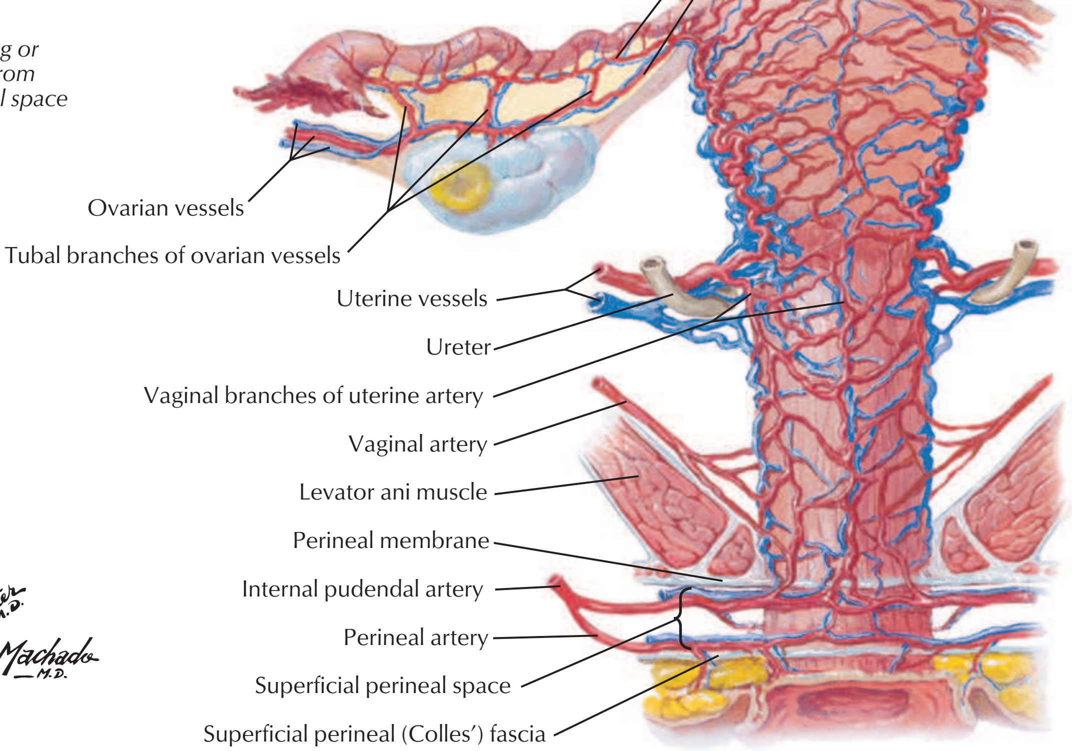
F. Netter M.D.


Aorta
Common iliac arteries
Ureter
Right Internal iliac vessels
External iliac vessels
Umbilical artery (fibrous part)
Superior vesical artery
Ductus (vas) deferens and artery to ductus (vas) deferens
Inferior epigastric vessels
Seminal vesicle
Urinary bladder
Vesical (retropubic) venous plexus
Prostate gland
Prostatic venous plexus
Cavernous vein
Superficial dorsal vein of penis
Deep dorsal vein and left dorsal artery of penis
External pudendal and anterior scrotal vessels
Testicular artery and ductus (vas) deferens
Median sacral artery and vein
Iliolumbar artery
Left external iliac vessels
Superior gluteal artery
Lateral sacral artery
Umbilical artery
Obturator artery
Left piriformis muscle (*cut*)
Inferior vesical artery
Coccygeus muscle (*cut*)
Inferior gluteal artery
Middle rectal artery
Internal pudendal artery
Levator ani muscle (*cut*)
Inferior rectal artery
Prostatic branches of inferior vesical artery and vein
Internal pudendal vein
Deep transverse perineal muscle (urogenital diaphragm) and ischiocavernosus muscle (*cut*)
Internal pudendal artery
Perineal artery
Posterior scrotal arteries
C. Machado M.D.

Arteries and Veins of Perineum and Uterus


Posterior labial artery
Ischiocavernosus muscle
Bulbospongiosus muscle
Superficial perineal space
Perineal membrane
Perineal artery
Superficial transverse perineal muscle
Perineal artery
Internal pudendal artery in pudendal canal (Alcock's)
Inferior rectal artery
External anal sphincter muscle
Dorsal artery of clitoris
Deep artery of clitoris
Bulb of vestibule
Compressor urethrae muscle
Artery to bulb of vestibule
Greater vestibular (Bartholin's) gland
Deep transverse perineal muscle
Internal pudendal (clitoral) artery
Perineal membrane (*cut away*)
Perineal artery (*cut*)
Superficial perineal (Colles') fascia (*cut and reflected*) to open superficial perineal space
Internal pudendal artery in pudendal canal (Alcock's)
Inferior rectal artery

Note: Deep perineal (investing or Gallaudet's) fascia removed from muscles of superficial perineal space


Round ligament
Tubal
Ovarian
Branches of uterine artery
Ovarian vessels
Tubal branches of ovarian vessels
Uterine vessels
Ureter
Vaginal branches of uterine artery
Vaginal artery
Levator ani muscle
Perineal membrane
Internal pudendal artery
Perineal artery
Superficial perineal space
Superficial perineal (Colles') fascia

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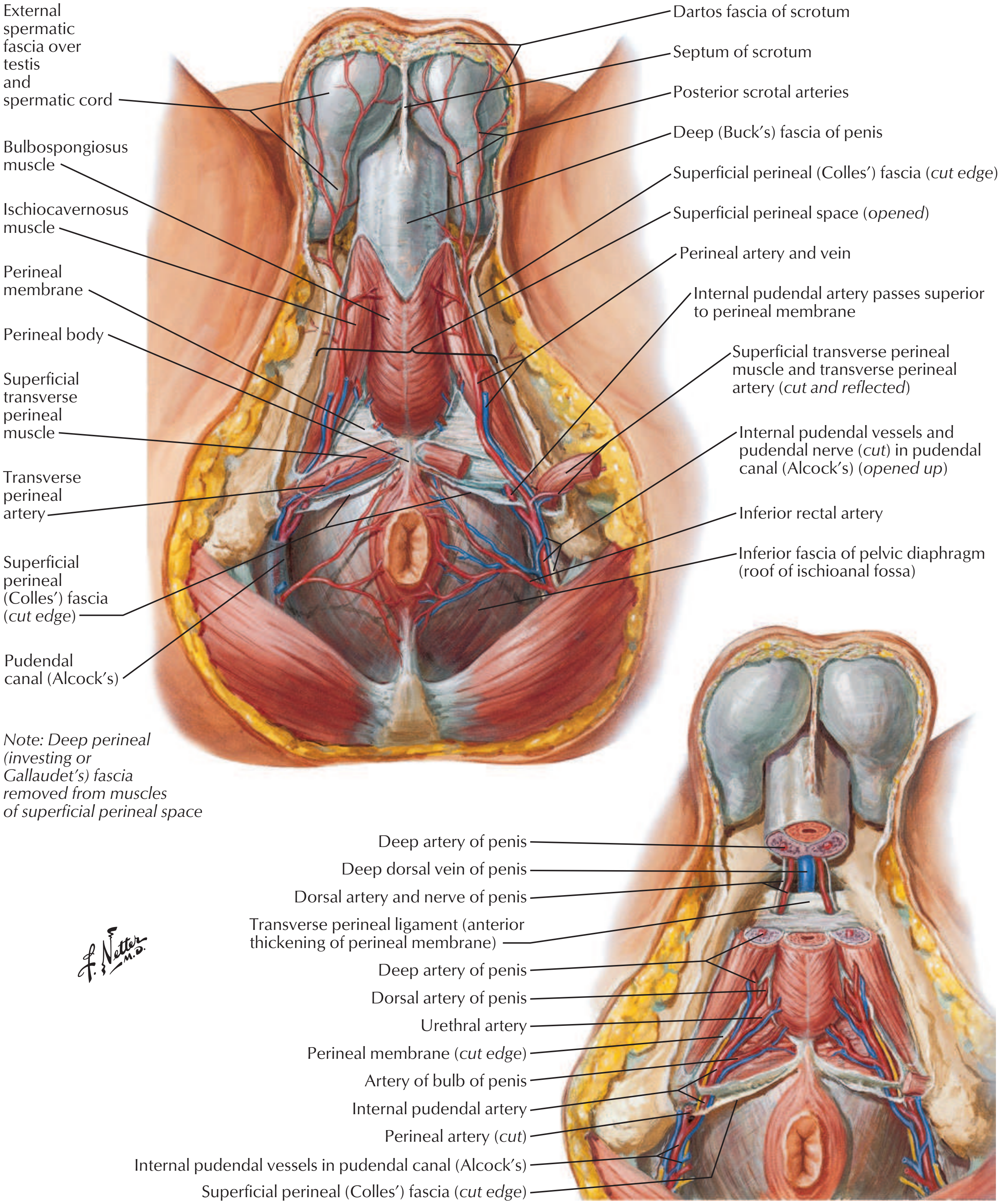
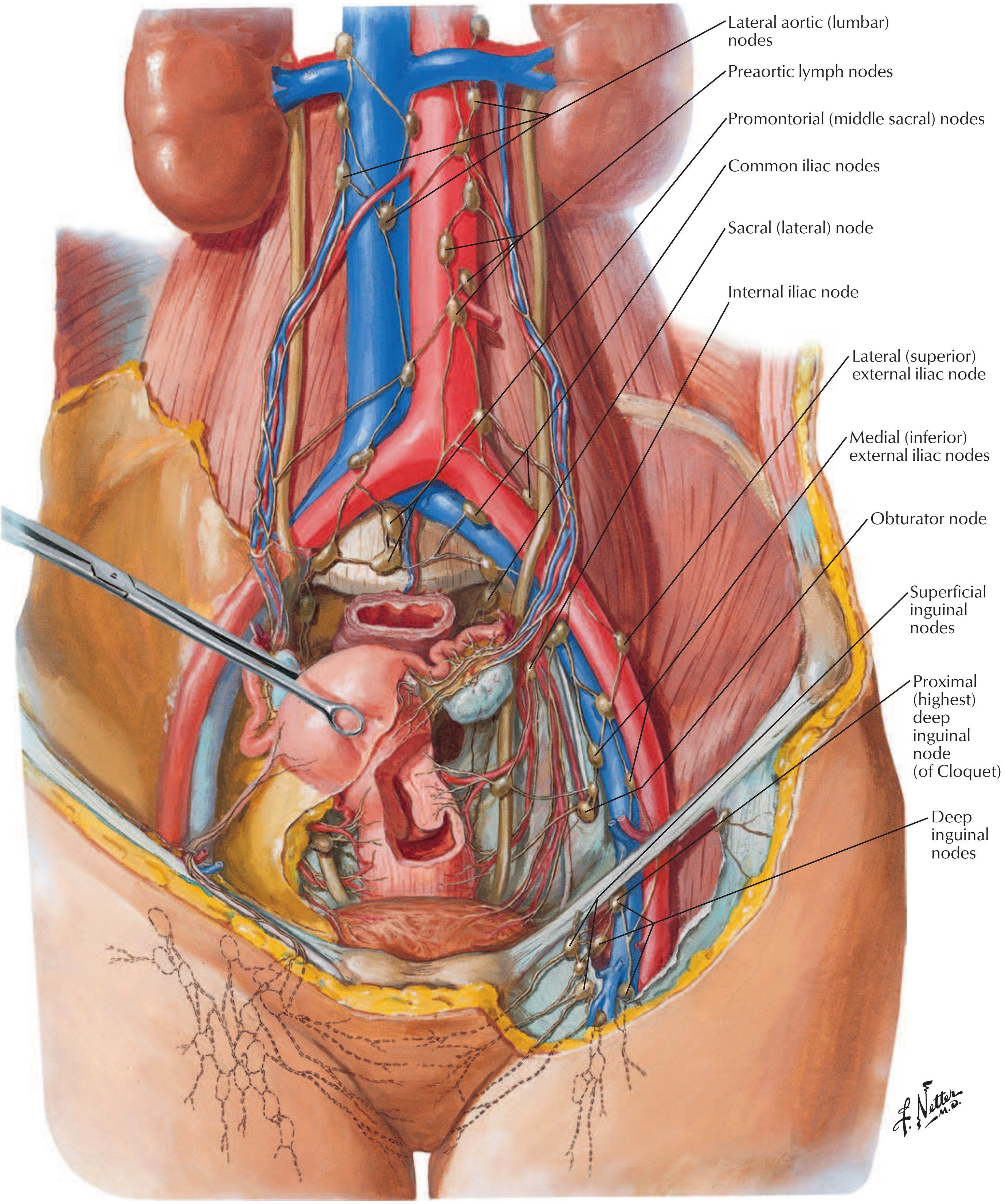
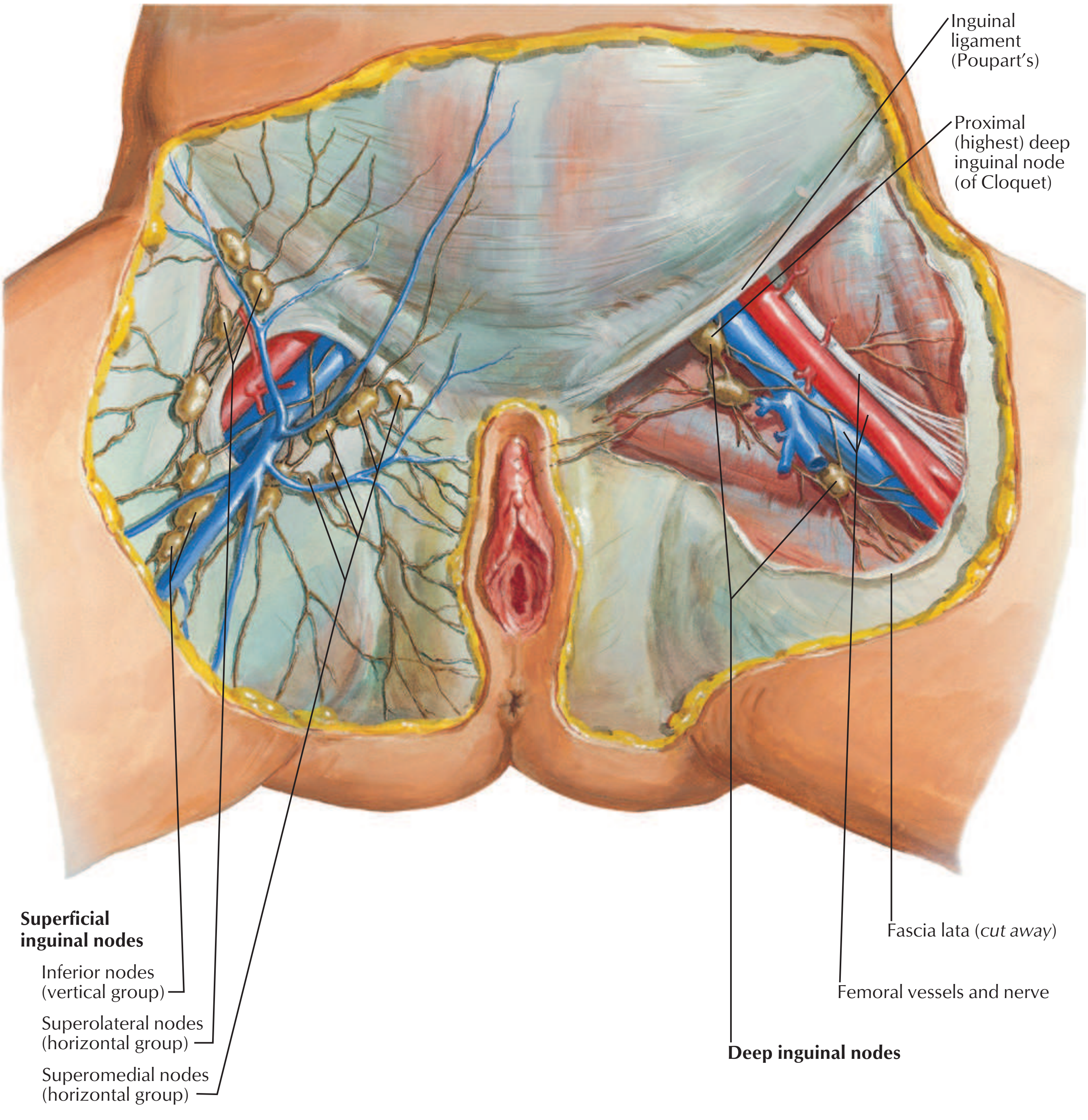
C. Machado M.D.


External spermatic fascia over testis and spermatic cord
Bulbospongiosus muscle
Ischiocavernosus muscle
Perineal membrane
Perineal body
Superficial transverse perineal muscle
Transverse perineal artery
Superficial perineal (Colles') fascia (*cut edge*)
Pudendal canal (Alcock's)
Dartos fascia of scrotum
Septum of scrotum
Posterior scrotal arteries
Deep (Buck's) fascia of penis
Superficial perineal (Colles') fascia (*cut edge*)
Superficial perineal space (*opened*)
Perineal artery and vein
Internal pudendal artery passes superior to perineal membrane
Superficial transverse perineal muscle and transverse perineal artery (*cut and reflected*)
Internal pudendal vessels and pudendal nerve (*cut*) in pudendal canal (Alcock's) (*opened up*)
Inferior rectal artery
Inferior fascia of pelvic diaphragm (roof of ischioanal fossa)
Deep artery of penis
Deep dorsal vein of penis
Dorsal artery and nerve of penis
Transverse perineal ligament (anterior thickening of perineal membrane)
Deep artery of penis
Dorsal artery of penis
Urethral artery
Perineal membrane (*cut edge*)
Artery of bulb of penis
Internal pudendal artery
Perineal artery (*cut*)
Internal pudendal vessels in pudendal canal (Alcock's)
Superficial perineal (Colles') fascia (*cut edge*)

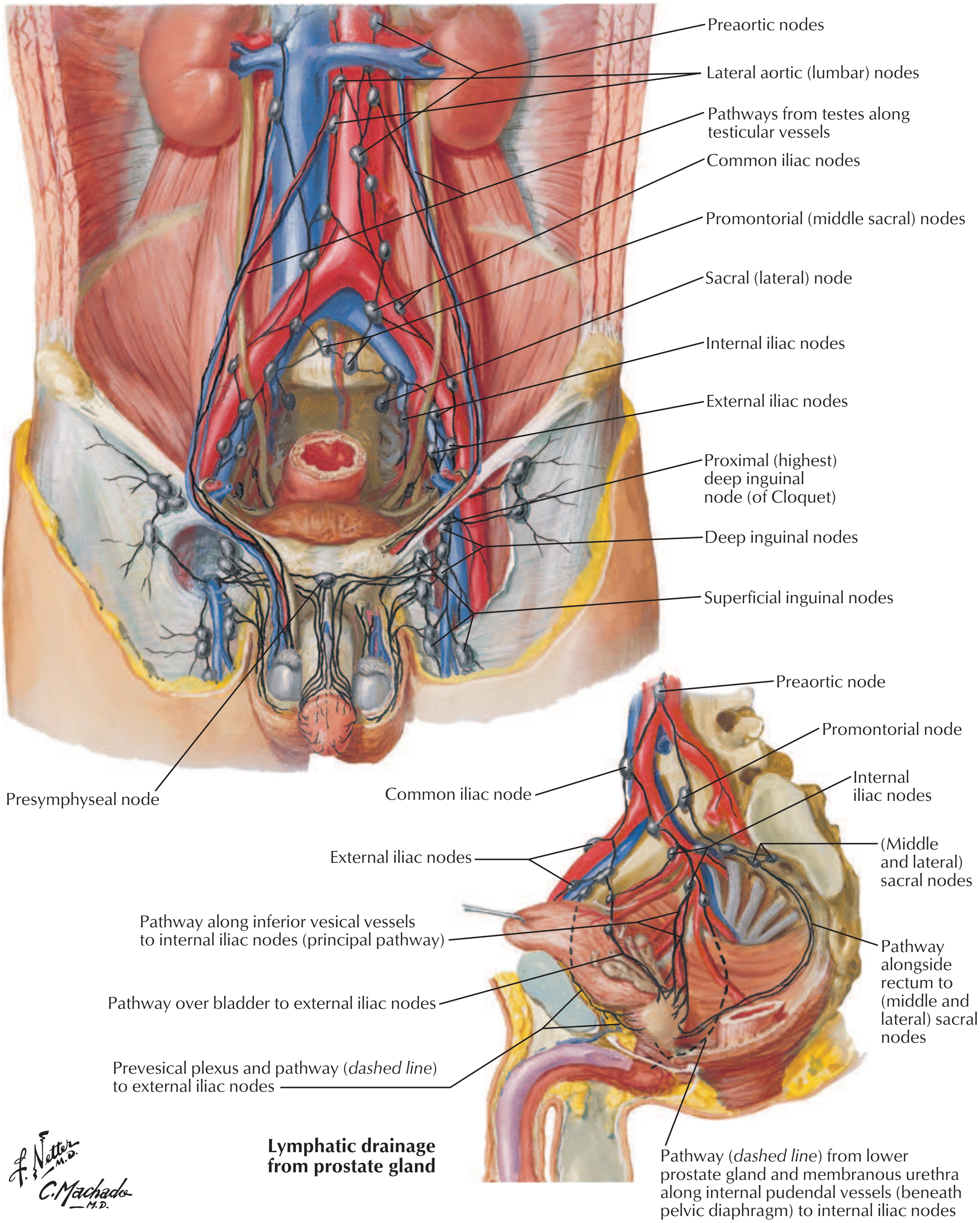
Note: Deep perineal (investing or Gallaudet's) fascia removed from muscles of superficial perineal space


Lateral aortic (lumbar) nodes
Preaortic lymph nodes
Promontorial (middle sacral) nodes
Common iliac nodes
Sacral (lateral) node
Internal iliac node
Lateral (superior) external iliac node
Medial (inferior) external iliac nodes
Obturator node
Superficial inguinal nodes
Proximal (highest) deep inguinal node (of Cloquet)
Deep inguinal nodes
F. Netter M.D.


Inguinal ligament (Poupart's)
Proximal (highest) deep inguinal node (of Cloquet)
Superficial inguinal nodes
Inferior nodes (vertical group)
Superolateral nodes (horizontal group)
Superomedial nodes (horizontal group)
Fascia lata (*cut away*)
Femoral vessels and nerve
Deep inguinal nodes

F. Netter M.D.

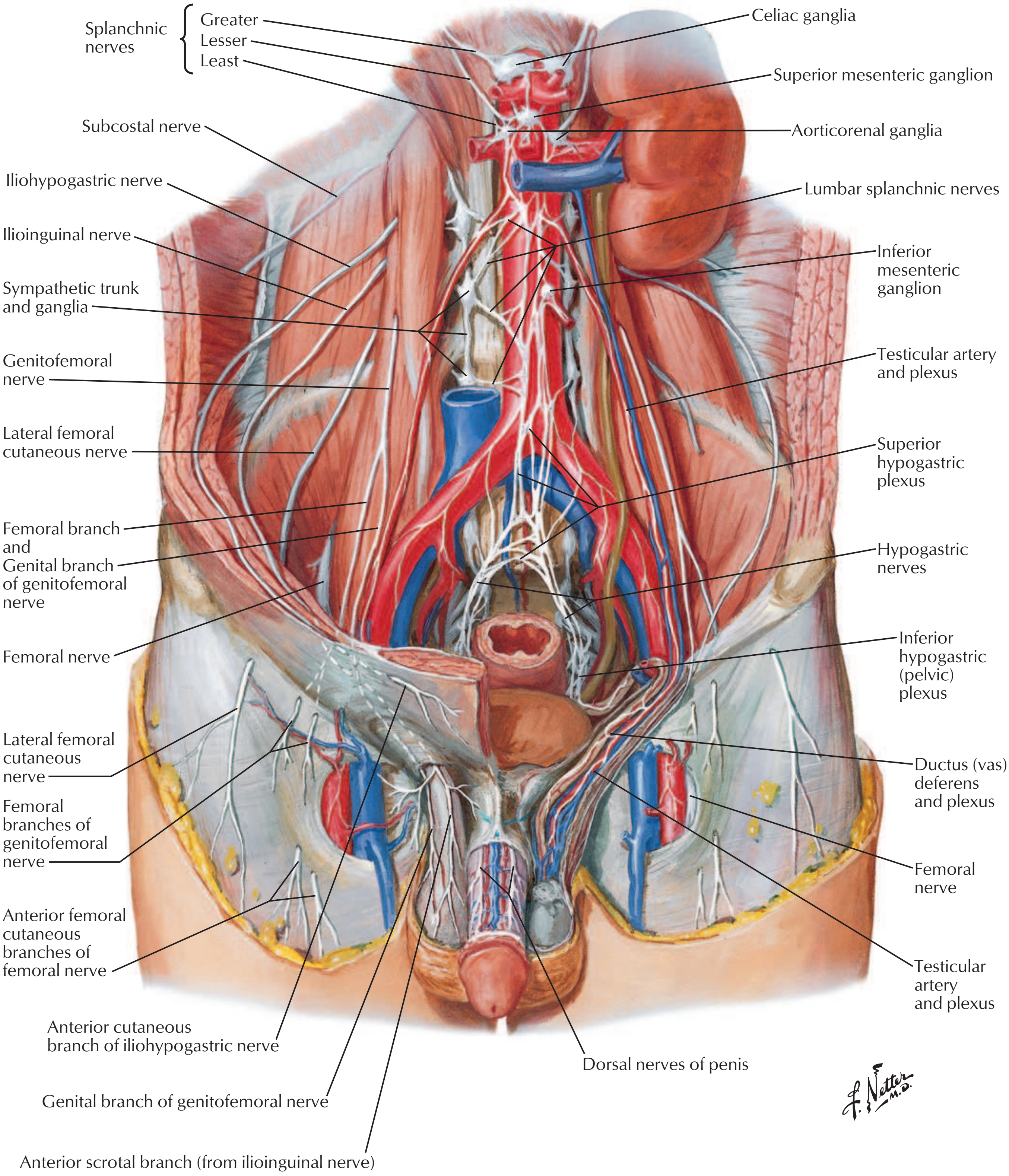
Lymph Vessels and Nodes of Pelvis and Genitalia: Male


Preaortic nodes
Lateral aortic (lumbar) nodes
Pathways from testes along testicular vessels
Common iliac nodes
Promontorial (middle sacral) nodes
Sacral (lateral) node
Internal iliac nodes
External iliac nodes
Proximal (highest) deep inguinal node (of Cloquet)
Deep inguinal nodes
Superficial inguinal nodes
Presymphyseal node
Preaortic node
Promontorial node
Common iliac node
Internal iliac nodes
External iliac nodes
(Middle and lateral) sacral nodes
Pathway along inferior vesical vessels to internal iliac nodes (principal pathway)
Pathway alongside rectum to (middle and lateral) sacral nodes
Pathway over bladder to external iliac nodes
Prevesical plexus and pathway (*dashed line*) to external iliac nodes
Pathway (*dashed line*) from lower prostate gland and membranous urethra along internal pudendal vessels (beneath pelvic diaphragm) to internal iliac nodes

Lymphatic drainage from prostate gland

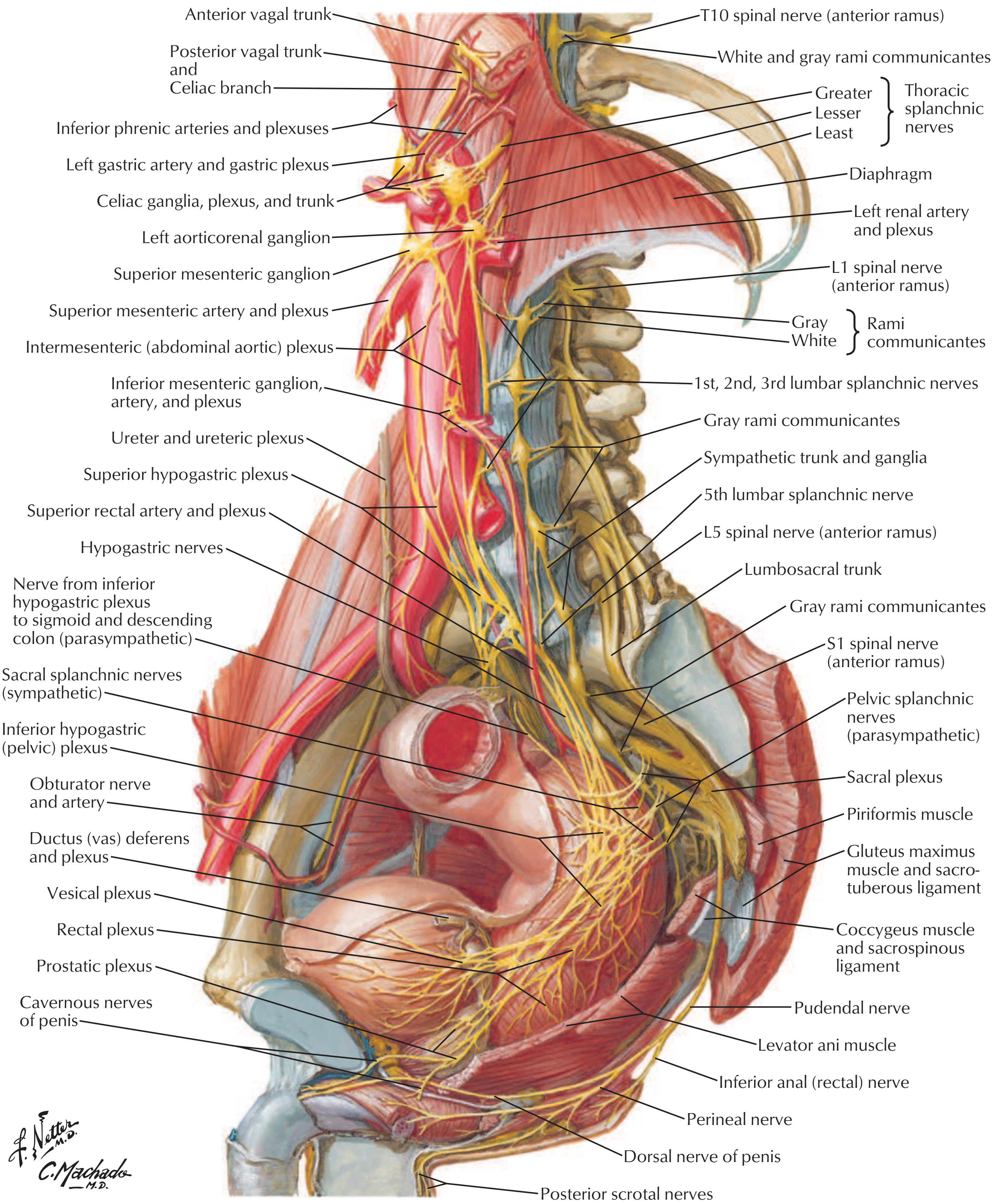
Nerves of External Genitalia: Male

See also Plate 300


Splanchnic nerves
Greater
Lesser
Least
Celiac ganglia
Superior mesenteric ganglion
Subcostal nerve
Aorticorenal ganglia
Iliohypogastric nerve
Lumbar splanchnic nerves
Ilioinguinal nerve
Inferior mesenteric ganglion
Sympathetic trunk and ganglia
Genitofemoral nerve
Testicular artery and plexus
Lateral femoral cutaneous nerve
Superior hypogastric plexus
Femoral branch and Genital branch of genitofemoral nerve
Hypogastric nerves
Femoral nerve
Inferior hypogastric (pelvic) plexus
Lateral femoral cutaneous nerve
Ductus (vas) deferens and plexus
Femoral branches of genitofemoral nerve
Femoral nerve
Anterior femoral cutaneous branches of femoral nerve
Testicular artery and plexus
Anterior cutaneous branch of iliohypogastric nerve
Dorsal nerves of penis
Genital branch of genitofemoral nerve
Anterior scrotal branch (from ilioinguinal nerve)
F. Netter M.D.

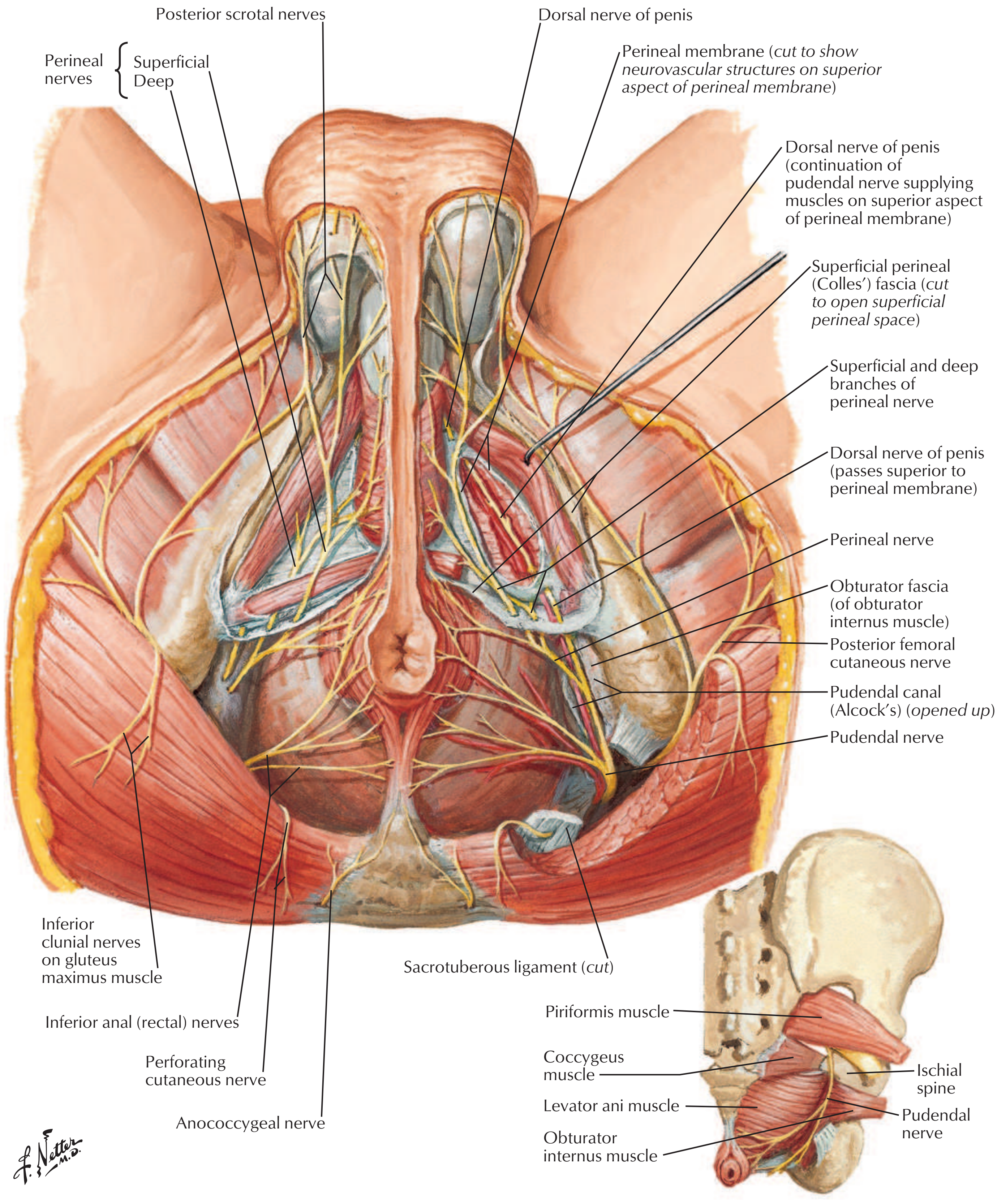
Nerves of Pelvic Viscera: Male

See also Plates 300, 385


Anterior vagal trunk
Posterior vagal trunk and Celiac branch
Inferior phrenic arteries and plexuses
Left gastric artery and gastric plexus
Celiac ganglia, plexus, and trunk
Left aorticorenal ganglion
Superior mesenteric ganglion
Superior mesenteric artery and plexus
Intermesenteric (abdominal aortic) plexus
Inferior mesenteric ganglion, artery, and plexus
Ureter and ureteric plexus
Superior hypogastric plexus
Superior rectal artery and plexus
Hypogastric nerves
Nerve from inferior hypogastric plexus to sigmoid and descending colon (parasympathetic)
Sacral splanchnic nerves (sympathetic)
Inferior hypogastric (pelvic) plexus
Obturator nerve and artery
Ductus (vas) deferens and plexus
Vesical plexus
Rectal plexus
Prostatic plexus
Cavernous nerves of penis
T10 spinal nerve (anterior ramus)
White and gray rami communicantes
Greater
Lesser
Least
Thoracic splanchnic nerves
Diaphragm
Left renal artery and plexus
L1 spinal nerve (anterior ramus)
Gray
White
Rami communicantes
1st, 2nd, 3rd lumbar splanchnic nerves
Gray rami communicantes
Sympathetic trunk and ganglia
5th lumbar splanchnic nerve
L5 spinal nerve (anterior ramus)
Lumbosacral trunk
Gray rami communicantes
S1 spinal nerve (anterior ramus)
Pelvic splanchnic nerves (parasympathetic)
Sacral plexus
Piriformis muscle
Gluteus maximus muscle and sacrotuberous ligament
Coccygeus muscle and sacrospinous ligament
Pudendal nerve
Levator ani muscle
Inferior anal (rectal) nerve
Perineal nerve
Dorsal nerve of penis
Posterior scrotal nerves
F. Netter M.D.
C. Machado M.D.

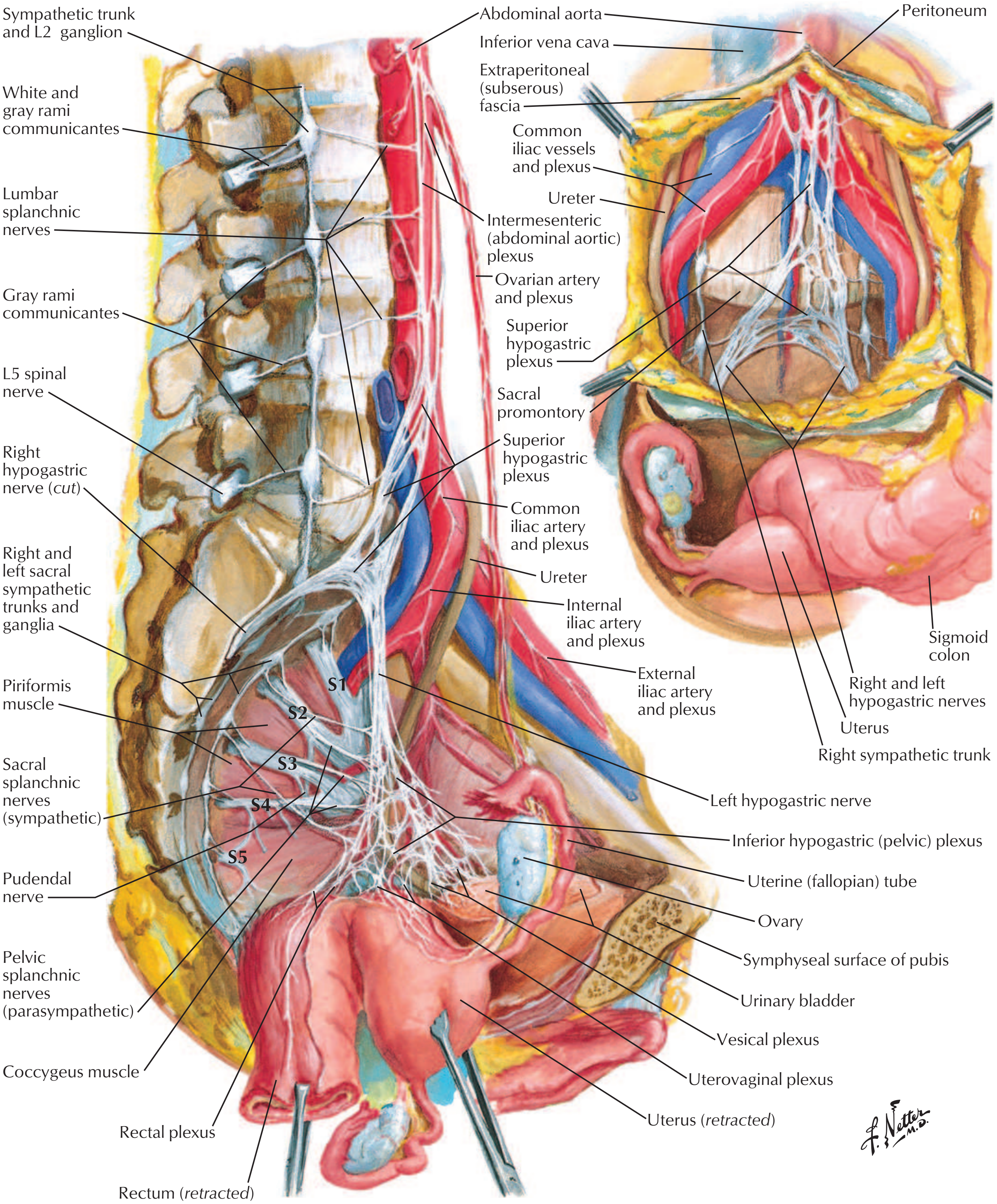
Nerves of Perineum: Male

See also Plate 398


Posterior scrotal nerves
Perineal nerves
Superficial
Deep
Dorsal nerve of penis
Perineal membrane (*cut to show neurovascular structures on superior aspect of perineal membrane*)
Dorsal nerve of penis (continuation of pudendal nerve supplying muscles on superior aspect of perineal membrane)
Superficial perineal (Colles') fascia (*cut to open superficial perineal space*)
Superficial and deep branches of perineal nerve
Dorsal nerve of penis (passes superior to perineal membrane)
Perineal nerve
Obturator fascia (of obturator internus muscle)
Posterior femoral cutaneous nerve
Pudendal canal (Alcock's) (*opened up*)
Pudendal nerve
Inferior clunial nerves on gluteus maximus muscle
Inferior anal (rectal) nerves
Perforating cutaneous nerve
Anococcygeal nerve
Sacrotuberous ligament (*cut*)
Piriformis muscle
Coccygeus muscle
Levator ani muscle
Obturator internus muscle
Ischial spine
Pudendal nerve
F. Netter M.D.

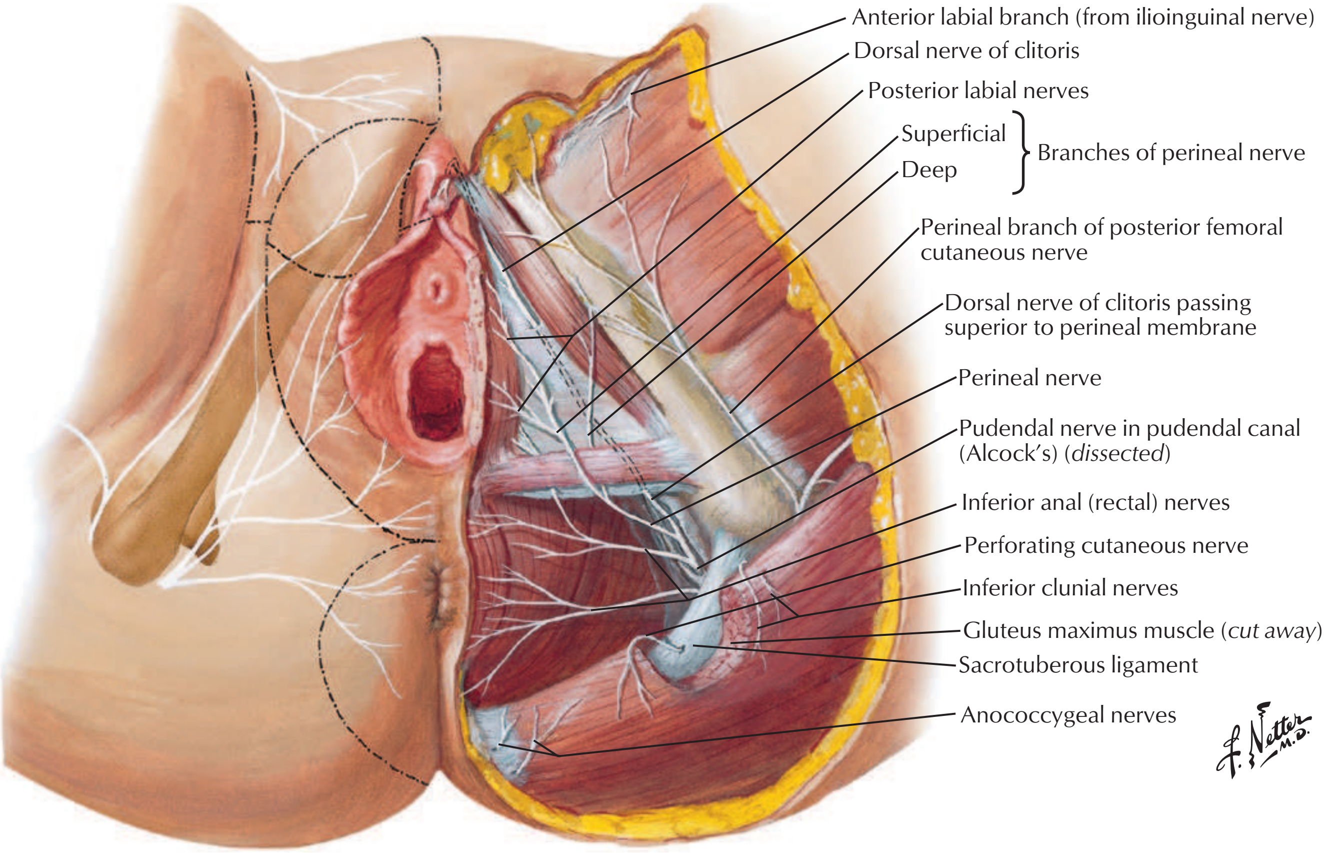
Nerves of Pelvic Viscera: Female

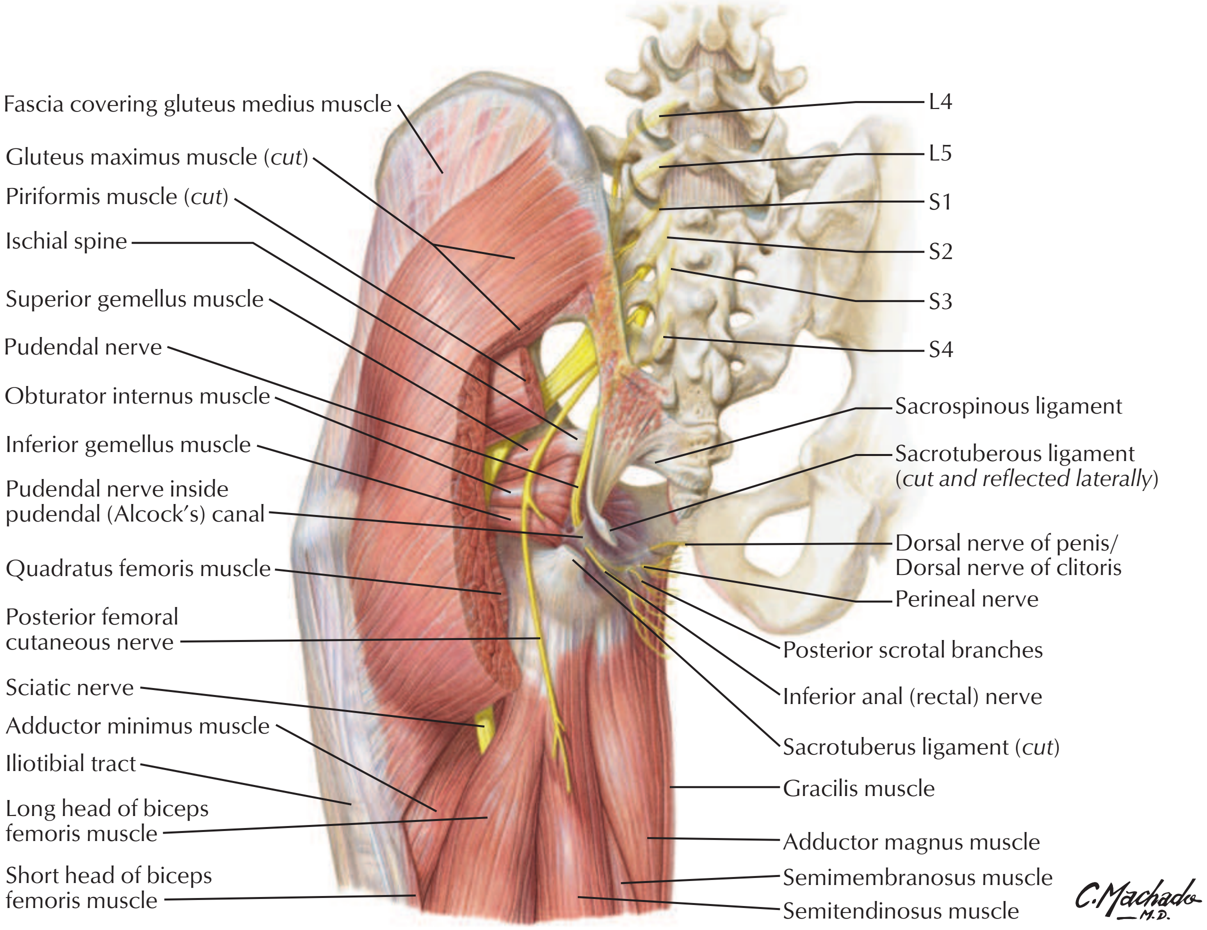
See also **Plate 300**



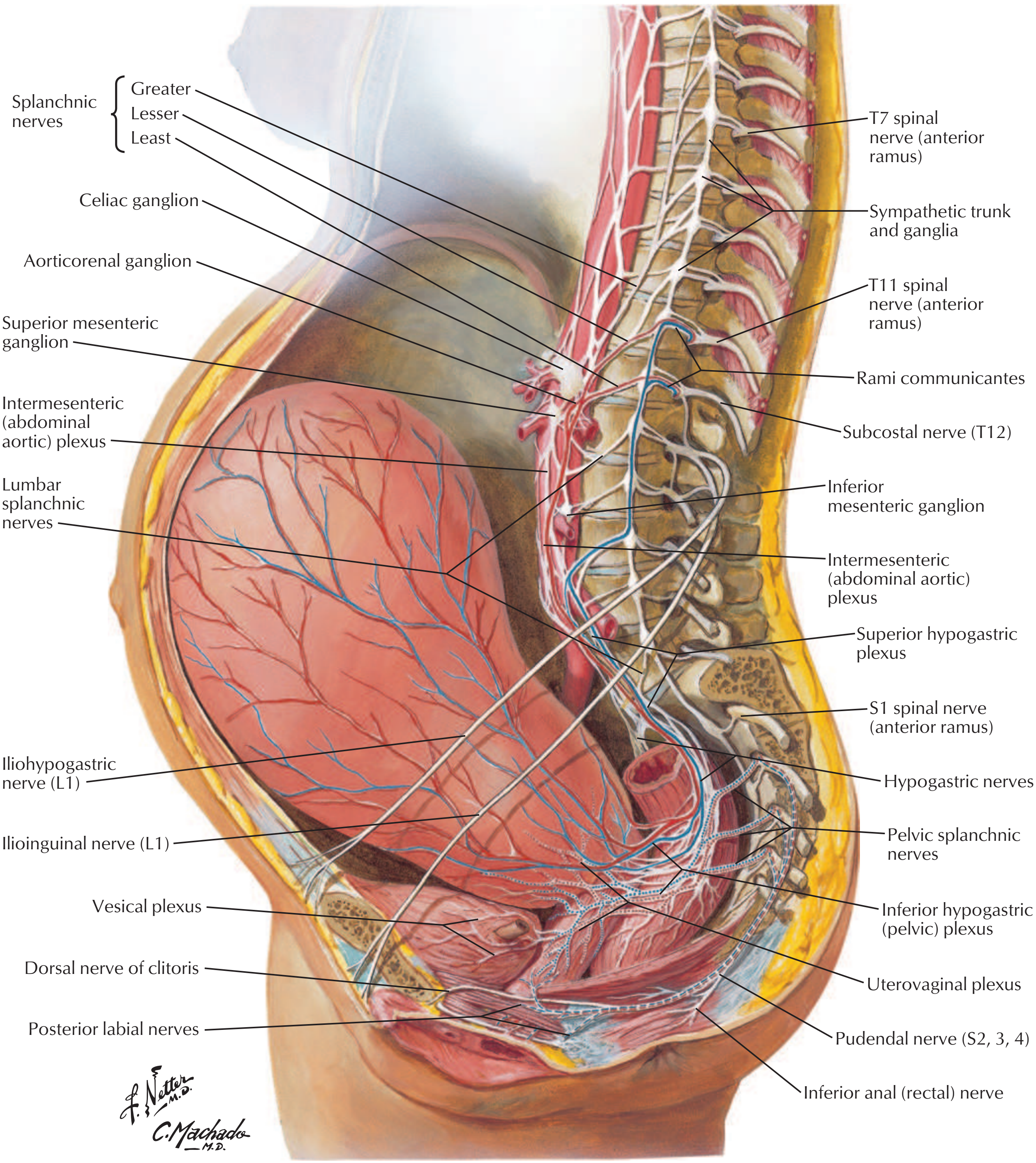
Sympathetic trunk and L2 ganglion
White and gray rami communicantes
Lumbar splanchnic nerves
Gray rami communicantes
L5 spinal nerve
Right hypogastric nerve (*cut*)
Right and left sacral sympathetic trunks and ganglia
Piriformis muscle
Sacral splanchnic nerves (sympathetic)
Pudendal nerve
Pelvic splanchnic nerves (parasympathetic)
Coccygeus muscle
Rectal plexus
Rectum (*retracted*)
S1
S2
S3
S4
S5
Abdominal aorta
Inferior vena cava
Extraperitoneal (subserous) fascia
Common iliac vessels and plexus
Ureter
Intermesenteric (abdominal aortic) plexus
Ovarian artery and plexus
Superior hypogastric plexus
Sacral promontory
Superior hypogastric plexus
Common iliac artery and plexus
Ureter
Internal iliac artery and plexus
External iliac artery and plexus
Peritoneum
Sigmoid colon
Right and left hypogastric nerves
Uterus
Right sympathetic trunk
Left hypogastric nerve
Inferior hypogastric (pelvic) plexus
Uterine (fallopian) tube
Ovary
Symphyseal surface of pubis
Urinary bladder
Vesical plexus
Uterovaginal plexus
Uterus (*retracted*)
F. Netter M.D.

Nerves of Perineum and External Genitalia: Female


Anterior labial branch (from ilioinguinal nerve)
Dorsal nerve of clitoris
Posterior labial nerves
Superficial
Deep
Branches of perineal nerve
Perineal branch of posterior femoral cutaneous nerve
Dorsal nerve of clitoris passing superior to perineal membrane
Perineal nerve
Pudendal nerve in pudendal canal (Alcock's) (*dissected*)
Inferior anal (rectal) nerves
Perforating cutaneous nerve
Inferior clunial nerves
Gluteus maximus muscle (*cut away*)
Sacrotuberous ligament
Anococcygeal nerves
F. Netter M.D.


Fascia covering gluteus medius muscle
Gluteus maximus muscle (*cut*)
Piriformis muscle (*cut*)
Ischial spine
Superior gemellus muscle
Pudendal nerve
Obturator internus muscle
Inferior gemellus muscle
Pudendal nerve inside pudendal (Alcock's) canal
Quadratus femoris muscle
Posterior femoral cutaneous nerve
Sciatic nerve
Adductor minimus muscle
Iliotibial tract
Long head of biceps femoris muscle
Short head of biceps femoris muscle
L4
L5
S1
S2
S3
S4
Sacrospinous ligament
Sacrotuberous ligament (*cut and reflected laterally*)
Dorsal nerve of penis/ Dorsal nerve of clitoris
Perineal nerve
Posterior scrotal branches
Inferior anal (rectal) nerve
Sacrotuberus ligament (*cut*)
Gracilis muscle
Adductor magnus muscle
Semimembranosus muscle
Semitendinosus muscle
C. Machado M.D.

Neuropathways in Parturition


Splanchnic nerves
Greater
Lesser
Least
Celiac ganglion
Aorticorenal ganglion
Superior mesenteric ganglion
Intermesenteric (abdominal aortic) plexus
Lumbar splanchnic nerves
Iliohypogastric nerve (L1)
Ilioinguinal nerve (L1)
Vesical plexus
Dorsal nerve of clitoris
Posterior labial nerves
T7 spinal nerve (anterior ramus)
Sympathetic trunk and ganglia
T11 spinal nerve (anterior ramus)
Rami communicantes
Subcostal nerve (T12)
Inferior mesenteric ganglion
Intermesenteric (abdominal aortic) plexus
Superior hypogastric plexus
S1 spinal nerve (anterior ramus)
Hypogastric nerves
Pelvic splanchnic nerves
Inferior hypogastric (pelvic) plexus
Uterovaginal plexus
Pudendal nerve (S2, 3, 4)
Inferior anal (rectal) nerve
F. Netter M.D.
C. Machado M.D.

—— Sensory fibers from uterine body and fundus accompany sympathetic fibers via hypogastric plexuses to T11, 12 (L1?)

—— Motor fibers to uterine body and fundus (sympathetic)

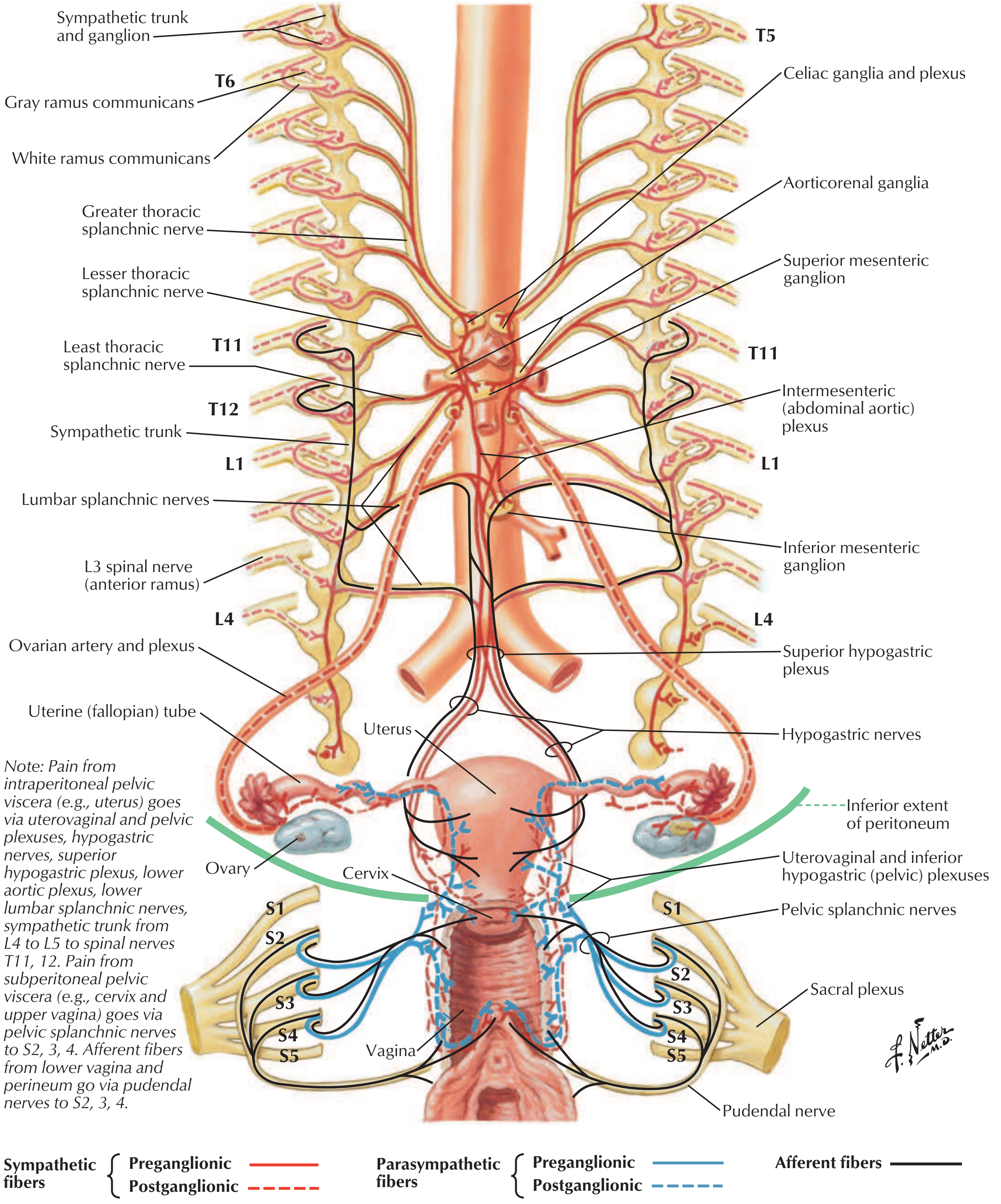
·········· Sensory fibers from cervix and upper vagina accompany pelvic splanchnic nerves (parasympathetic) to S2, 3, 4

·········· Motor fibers to lower uterine segment, cervix, and upper vagina (parasympathetic)

– – – – Sensory fibers from lower vagina and perineum accompany somatic fibers via pudendal nerve to S2, 3, 4

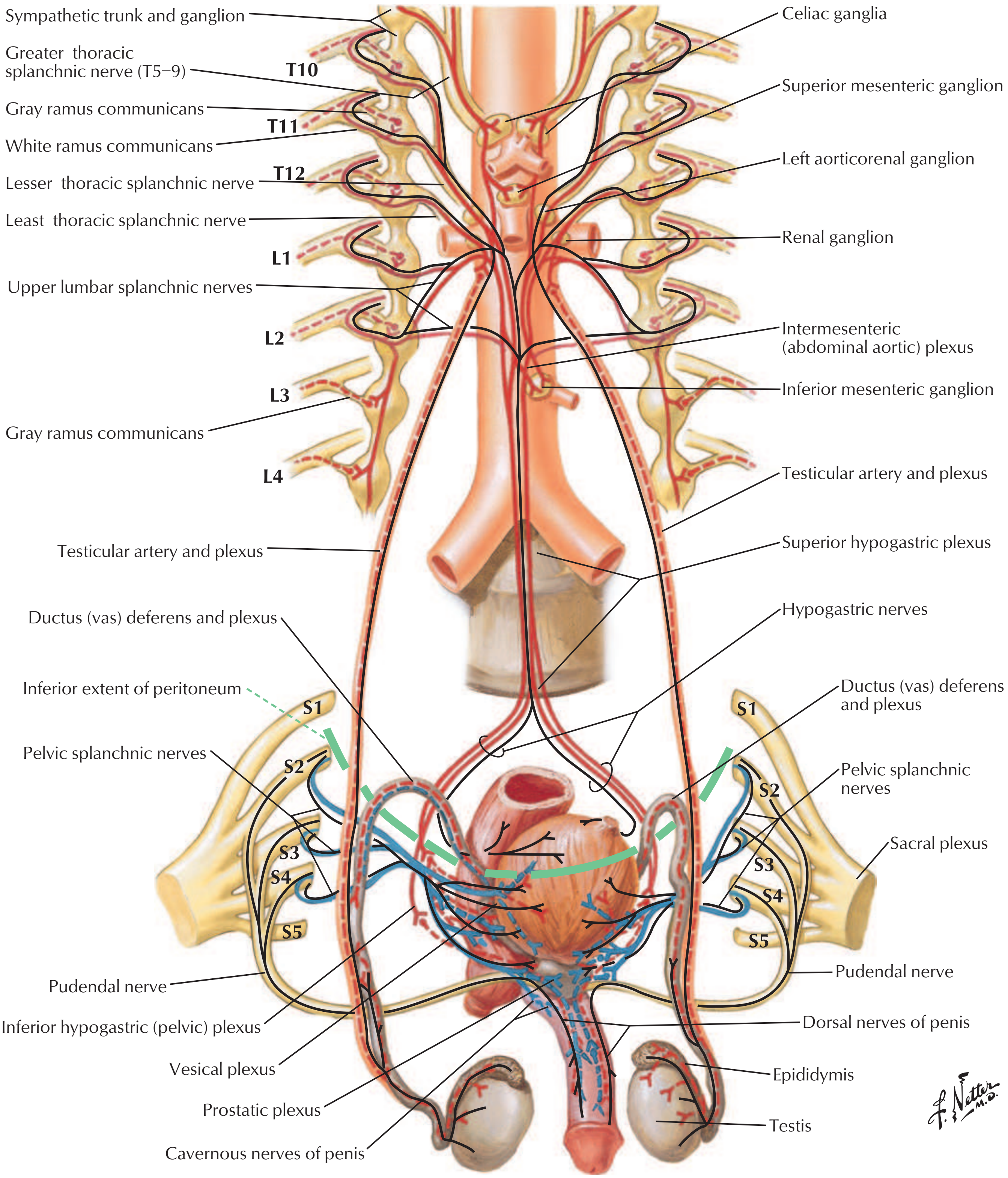
- - - - - Motor fibers to lower vagina and perineum via pudendal nerve (somatic)

Innervation of Female Reproductive Organs: Schema


Sympathetic trunk and ganglion
T5
T6
Gray ramus communicans
Celiac ganglia and plexus
White ramus communicans
Aorticorenal ganglia
Greater thoracic splanchnic nerve
Superior mesenteric ganglion
Lesser thoracic splanchnic nerve
Least thoracic splanchnic nerve
T11
T11
T12
Intermesenteric (abdominal aortic) plexus
Sympathetic trunk
L1
L1
Lumbar splanchnic nerves
Inferior mesenteric ganglion
L3 spinal nerve (anterior ramus)
L4
L4
Ovarian artery and plexus
Superior hypogastric plexus
Uterine (fallopian) tube
Uterus
Hypogastric nerves
Inferior extent of peritoneum
Ovary
Cervix
Uterovaginal and inferior hypogastric (pelvic) plexuses
S1
S1
Pelvic splanchnic nerves
S2
S2
S3
S3
Sacral plexus
S4
S5
S4
S5
Vagina
Pudendal nerve
Sympathetic fibers
Preganglionic
Postganglionic
Parasympathetic fibers
Preganglionic
Postganglionic
Afferent fibers

Note: Pain from intraperitoneal pelvic viscera (e.g., uterus) goes via uterovaginal and pelvic plexuses, hypogastric nerves, superior hypogastric plexus, lower aortic plexus, lower lumbar splanchnic nerves, sympathetic trunk from L4 to L5 to spinal nerves T11, 12. Pain from subperitoneal pelvic viscera (e.g., cervix and upper vagina) goes via pelvic splanchnic nerves to S2, 3, 4. Afferent fibers from lower vagina and perineum go via pudendal nerves to S2, 3, 4.

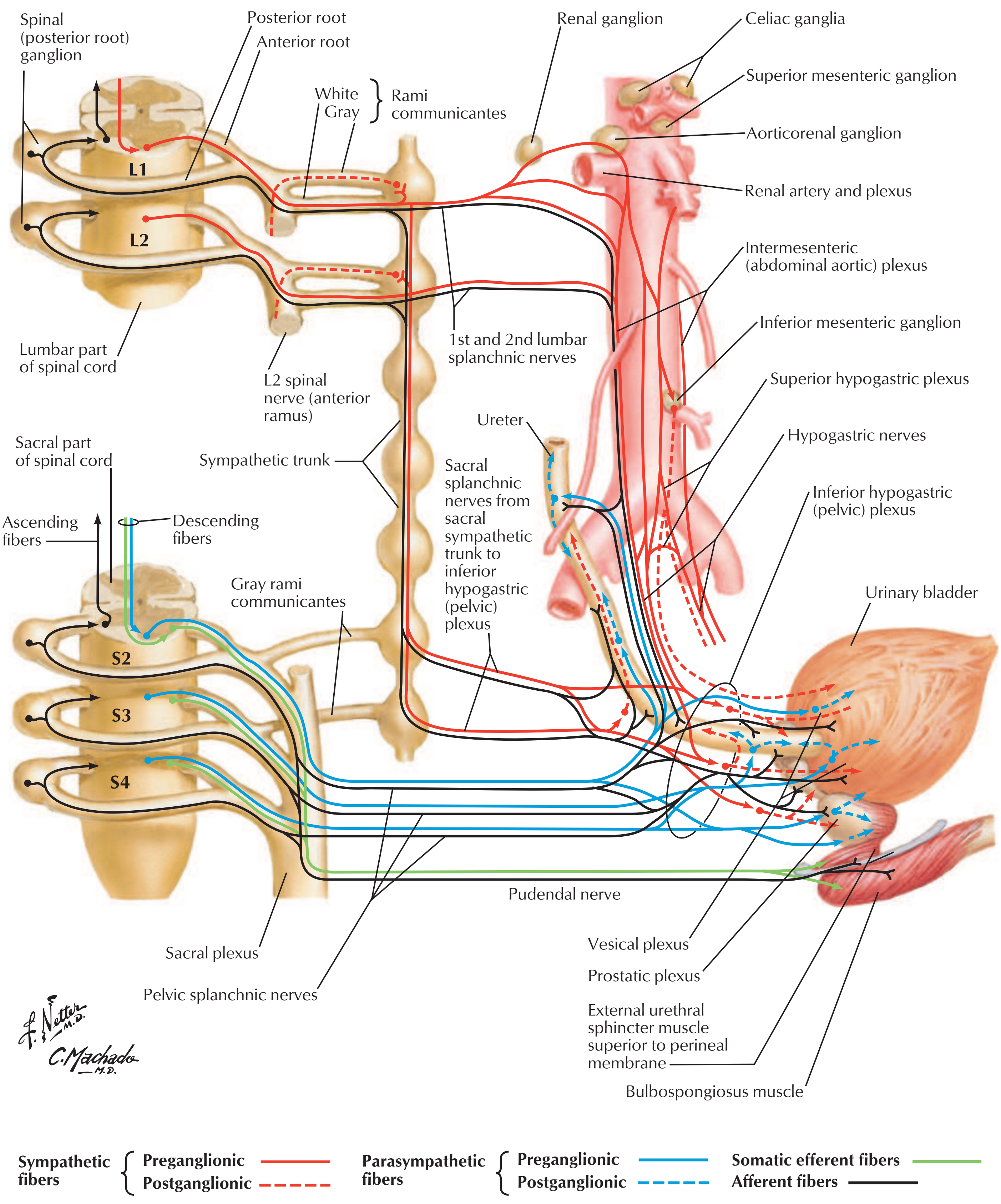
Innervation of Male Reproductive Organs: Schema


Sympathetic trunk and ganglion
Greater thoracic splanchnic nerve (T5–9)
T10
Gray ramus communicans
T11
White ramus communicans
T12
Lesser thoracic splanchnic nerve
Least thoracic splanchnic nerve
L1
Upper lumbar splanchnic nerves
L2
L3
Gray ramus communicans
L4
Testicular artery and plexus
Ductus (vas) deferens and plexus
Inferior extent of peritoneum
S1
Pelvic splanchnic nerves
S2
S3
S4
S5
Pudendal nerve
Inferior hypogastric (pelvic) plexus
Vesical plexus
Prostatic plexus
Cavernous nerves of penis
Celiac ganglia
Superior mesenteric ganglion
Left aorticorenal ganglion
Renal ganglion
Intermesenteric (abdominal aortic) plexus
Inferior mesenteric ganglion
Testicular artery and plexus
Superior hypogastric plexus
Hypogastric nerves
Ductus (vas) deferens and plexus
S1
Pelvic splanchnic nerves
S2
Sacral plexus
S3
S4
S5
Pudendal nerve
Dorsal nerves of penis
Epididymis
Testis

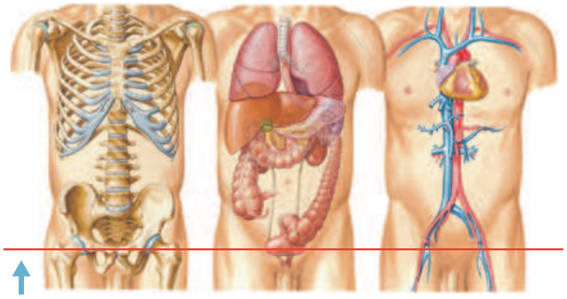
Sympathetic fibers { Preganglionic ━━━ ; Postganglionic - - - -

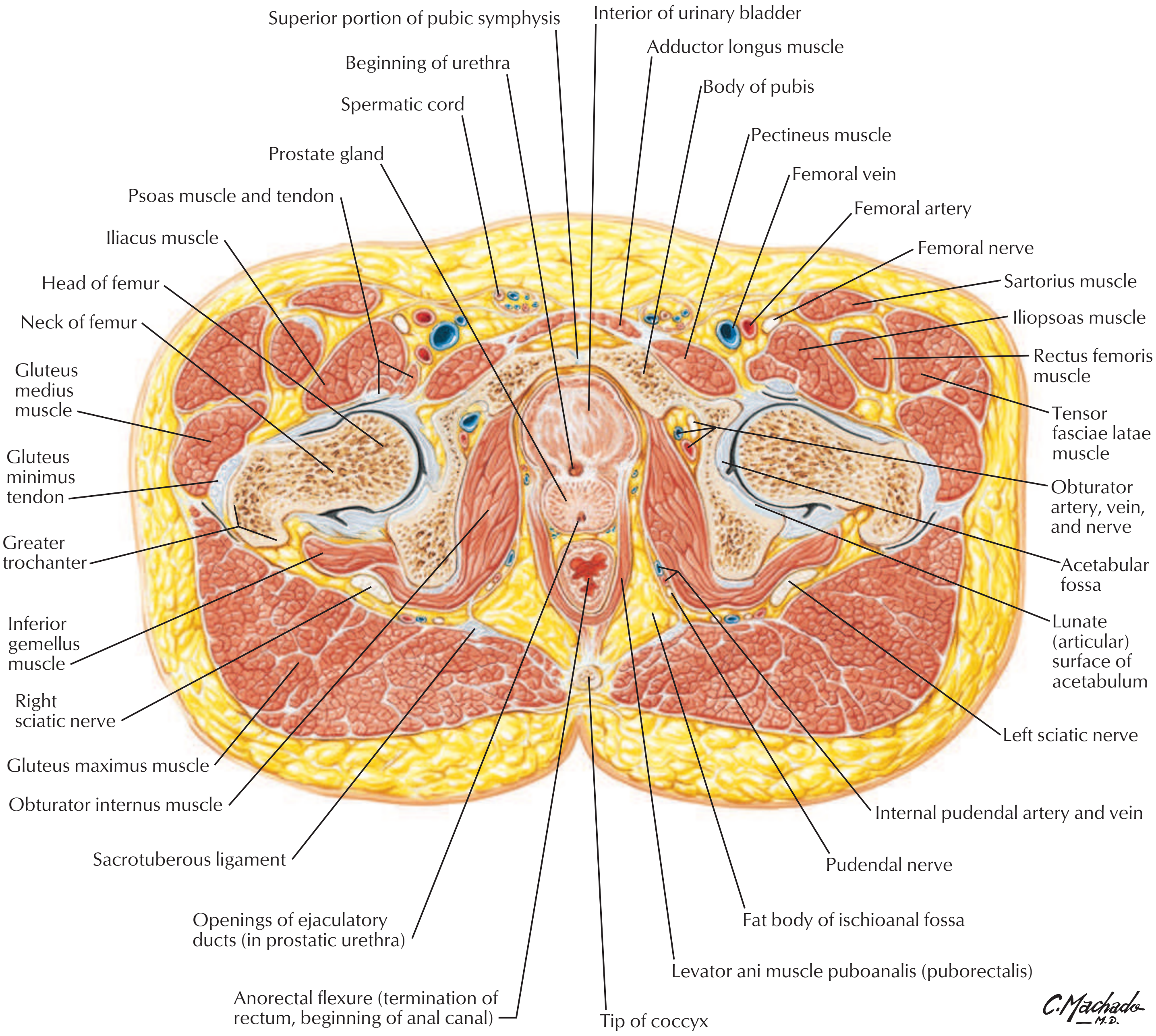
Parasympathetic fibers { Preganglionic ━━━ ; Postganglionic - - - -

Afferent fibers ━━━


Spinal (posterior root) ganglion
Posterior root
Anterior root
White
Gray
Rami communicantes
Renal ganglion
Celiac ganglia
Superior mesenteric ganglion
Aorticorenal ganglion
Renal artery and plexus
L1
L2
Intermesenteric (abdominal aortic) plexus
Inferior mesenteric ganglion
Lumbar part of spinal cord
L2 spinal nerve (anterior ramus)
1st and 2nd lumbar splanchnic nerves
Superior hypogastric plexus
Ureter
Hypogastric nerves
Sacral part of spinal cord
Sympathetic trunk
Sacral splanchnic nerves from sacral sympathetic trunk to inferior hypogastric (pelvic) plexus
Inferior hypogastric (pelvic) plexus
Ascending fibers
Descending fibers
Gray rami communicantes
Urinary bladder
S2
S3
S4
Pudendal nerve
Sacral plexus
Vesical plexus
Prostatic plexus
Pelvic splanchnic nerves
External urethral sphincter muscle superior to perineal membrane
Bulbospongiosus muscle
Sympathetic fibers
Preganglionic
Postganglionic
Parasympathetic fibers
Preganglionic
Postganglionic
Somatic efferent fibers
Afferent fibers

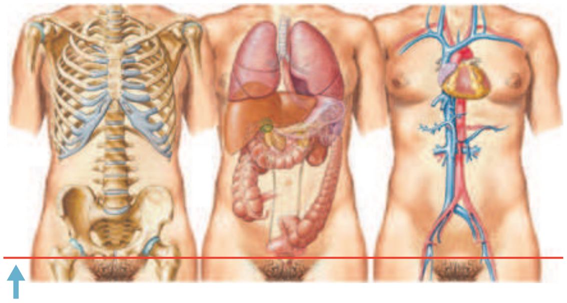
Male Pelvis: Cross Section of Bladder–Prostate Gland Junction

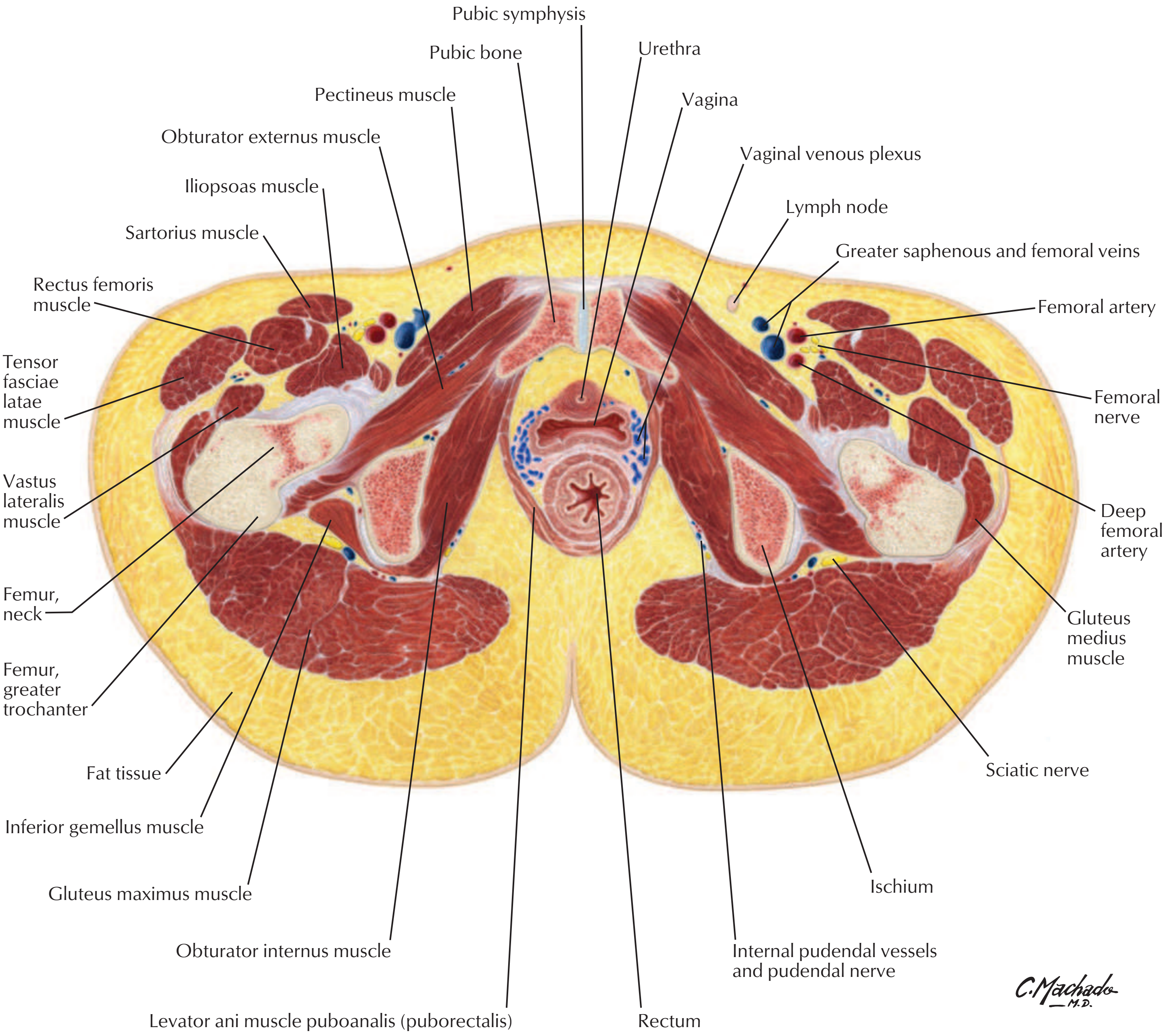




Superior portion of pubic symphysis
Interior of urinary bladder
Adductor longus muscle
Beginning of urethra
Body of pubis
Spermatic cord
Pectineus muscle
Prostate gland
Femoral vein
Psoas muscle and tendon
Femoral artery
Iliacus muscle
Femoral nerve
Head of femur
Sartorius muscle
Neck of femur
Iliopsoas muscle
Rectus femoris muscle
Gluteus medius muscle
Tensor fasciae latae muscle
Gluteus minimus tendon
Obturator artery, vein, and nerve
Greater trochanter
Acetabular fossa
Lunate (articular) surface of acetabulum
Inferior gemellus muscle
Right sciatic nerve
Left sciatic nerve
Gluteus maximus muscle
Obturator internus muscle
Internal pudendal artery and vein
Sacrotuberous ligament
Pudendal nerve
Openings of ejaculatory ducts (in prostatic urethra)
Fat body of ischioanal fossa
Levator ani muscle puboanalis (puborectalis)
Anorectal flexure (termination of rectum, beginning of anal canal)
Tip of coccyx
C. Machado M.D.

Female Pelvis: Cross Section of Vagina and Urethra




Pubic symphysis
Pubic bone
Urethra
Pectineus muscle
Vagina
Obturator externus muscle
Vaginal venous plexus
Iliopsoas muscle
Lymph node
Sartorius muscle
Greater saphenous and femoral veins
Rectus femoris muscle
Femoral artery
Tensor fasciae latae muscle
Femoral nerve
Vastus lateralis muscle
Deep femoral artery
Femur, neck
Gluteus medius muscle
Femur, greater trochanter
Fat tissue
Sciatic nerve
Inferior gemellus muscle
Ischium
Gluteus maximus muscle
Obturator internus muscle
Internal pudendal vessels and pudendal nerve
Levator ani muscle puboanalis (puborectalis)
Rectum
C.Machado M.D.

Structures With High* Clinical Significance

ANATOMICAL STRUCTURES	CLINICAL IMPORTANCE	PLATE NUMBERS
SKELETAL SYSTEM		
Pubic symphysis	Palpable landmark used to obtain pelvic measurements (e.g., diagonal conjugate) that are used to assess adequacy of pelvis for childbirth; during prenatal examinations, used for estimating fetal growth (symphysis–fundal height measurement)	336
Ischial spine	Palpable landmark used to estimate interspinous diameter for childbirth and to locate pudendal nerve for pudendal nerve block	336
Ischial tuberosity	Palpable landmark used to estimate width of pelvic outlet for childbirth	336
Superior pubic ramus	Often fractured by compression of pelvis in anteroposterior plane by crush injury	338
Ischial spine	Pudendal nerve blocks target pudendal nerve at its entry into lesser sciatic foramen, approximately 1 cm inferior and medial to attachment of sacrospinous ligament on ischial spine	384, 393
MUSCULAR SYSTEM		
Pelvic diaphragm (levator ani and coccygeus muscles)	Provides support to urethrovesical angle, helping to maintain urinary continence; weakness or injury during childbirth can lead to stress incontinence in women	340, 351
Endopelvic fascia	Weakness or tearing of endopelvic fascial ligaments (e.g., pubovesical or cardinal ligaments) facilitates prolapse of pelvic organs	350, 353
Perineal body	Tearing of perineal body can lead to prolapse of pelvic organs or loss of continence	360
DIGESTIVE SYSTEM		
Rectum	Examined by digital rectal examination to detect internal hemorrhoids, fecal impaction, and rectal cancer; provides access to colon for colonoscopy	373, 375
Peritoneum	Common site for metastatic spread of ovarian cancer via peritoneal fluid in peritoneal cavity	344, 345
URINARY SYSTEM		
Urinary bladder	Landmark used to identify structures of pelvis during ultrasound examination	349, 350
Ureter	May be injured during hysterectomy because of its close relationship to uterine artery	346, 347
REPRODUCTIVE SYSTEM		
Rectouterine pouch (of Douglas)	Region examined with ultrasound to detect presence of abdominal or pelvic fluid; common site of ectopic pregnancy; may be accessed via posterior vaginal fornix	345, 346
Uterus	Palpated during prenatal examinations to assess fetal growth and during pelvic examinations; examined with ultrasound to detect abnormalities (e.g., fibroids)	345, 355
Cervix of uterus	Epithelium of transformation zone of cervix is prone to dysplasia and malignancy; cells are sampled from this region during pap examination	353, 355
Vagina	Posterior vaginal fornix allows access to rectouterine pouch of Douglas	345
Prostate gland	Prone to benign hypertrophy with aging; prostate cancer is second most common cancer in men	349, 366

Table 6.1

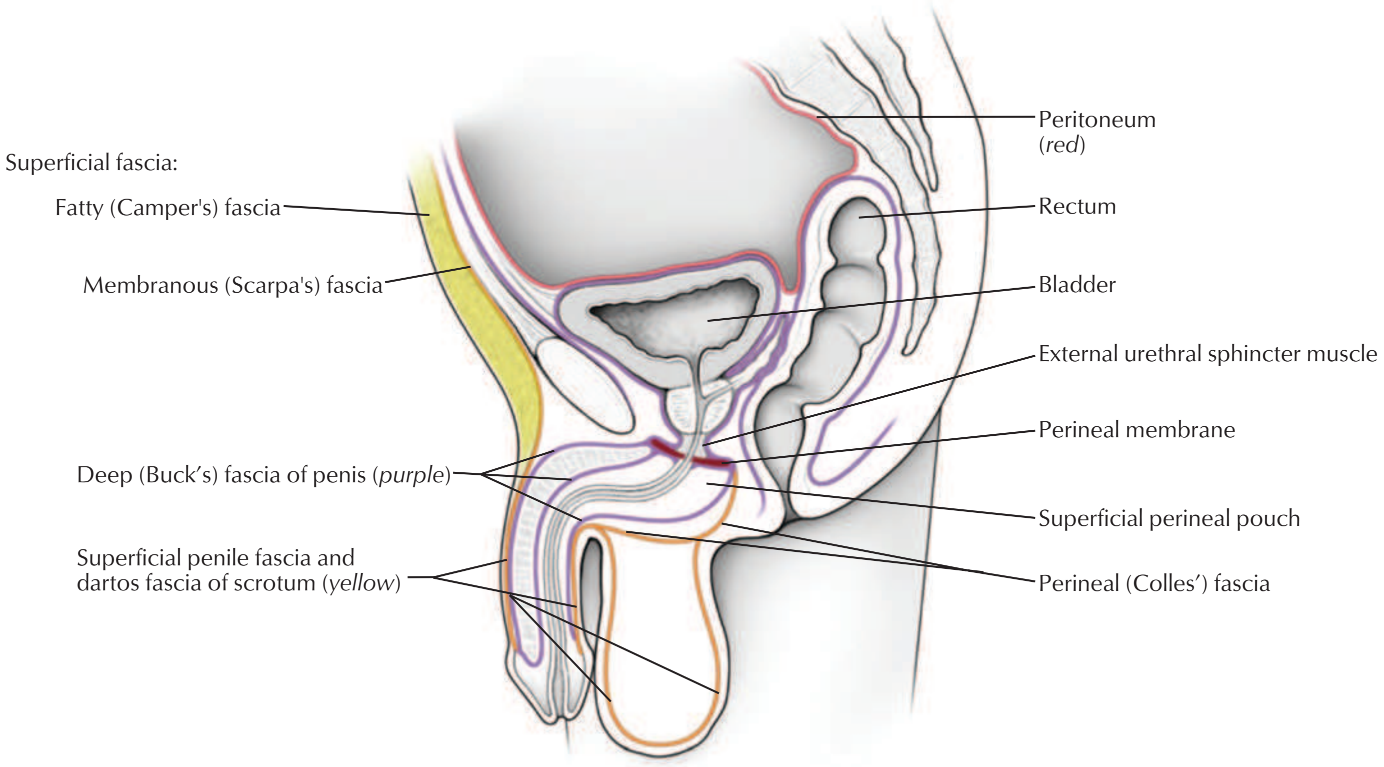
ANATOMICAL STRUCTURES	CLINICAL IMPORTANCE	PLATE NUMBERS
REPRODUCTIVE SYSTEM—Continued		
Ovary	Examined with ultrasound to identify cysts or for oocyte collection	344, 355
Ductus (vas) deferens	Ligated during vasectomy for sterilization in males	349, 369
NERVOUS SYSTEM		
Pudendal nerve	Pudendal block is performed to anesthetize perineum for childbirth or minor surgical procedures in perineum	395
Inferior rectal nerve	Anesthetized in ischioanal fossa for surgical excision of external hemorrhoids	393
Prostatic plexus/cavernous nerves	Disruption of these nerves during procedures (e.g., prostate surgery) can produce inability to achieve erection	392
CARDIOVASCULAR SYSTEM		
Pampiniform venous plexus	Dilation can cause testicular varicocele, most commonly on left side due to differences in drainage pattern of right and left gonadal veins	369
Uterine artery	Ligated or cauterized during hysterectomy; embolization is performed to treat uterine fibroids	382, 386
Arteries of penis (deep, dorsal), cavernous tissue	Blockage or loss of vascular smooth muscle function can lead to erectile dysfunction	387
Internal iliac veins	Provide communication between prostatic venous plexus and veins draining vertebral column, which is route of spread for prostate cancer	385
Rectal veins (superior, middle, inferior)	Portal hypertension may cause dilated rectal veins (hemorrhoids) because portosystemic anastomoses develop between rectal veins	381, 299
LYMPHATIC SYSTEM		
Pelvic and paraaortic (lateral aortic, lumbar) lymph nodes	Spread of ovarian cancer cells via venous drainage to inferior vena cava and lungs and via lymphatics	388
Paraaortic and tracheobronchial lymph nodes	Prostate cancer cells may spread via lymphatics	390
Preaortic and paraaortic (lateral aortic, lumbar) lymph nodes	Receive lymphatic drainage from ovary, uterine tube, and uterine fundus in women and from testis in men; cancers in these organs may therefore spread to retroperitoneum	388, 390
Pelvic lymph nodes	Lymph node sampling or dissection is performed to assess spread of gynecologic malignancies	388

*Selections were based largely on clinical data as well as commonly covered clinical correlations in gross anatomy courses.

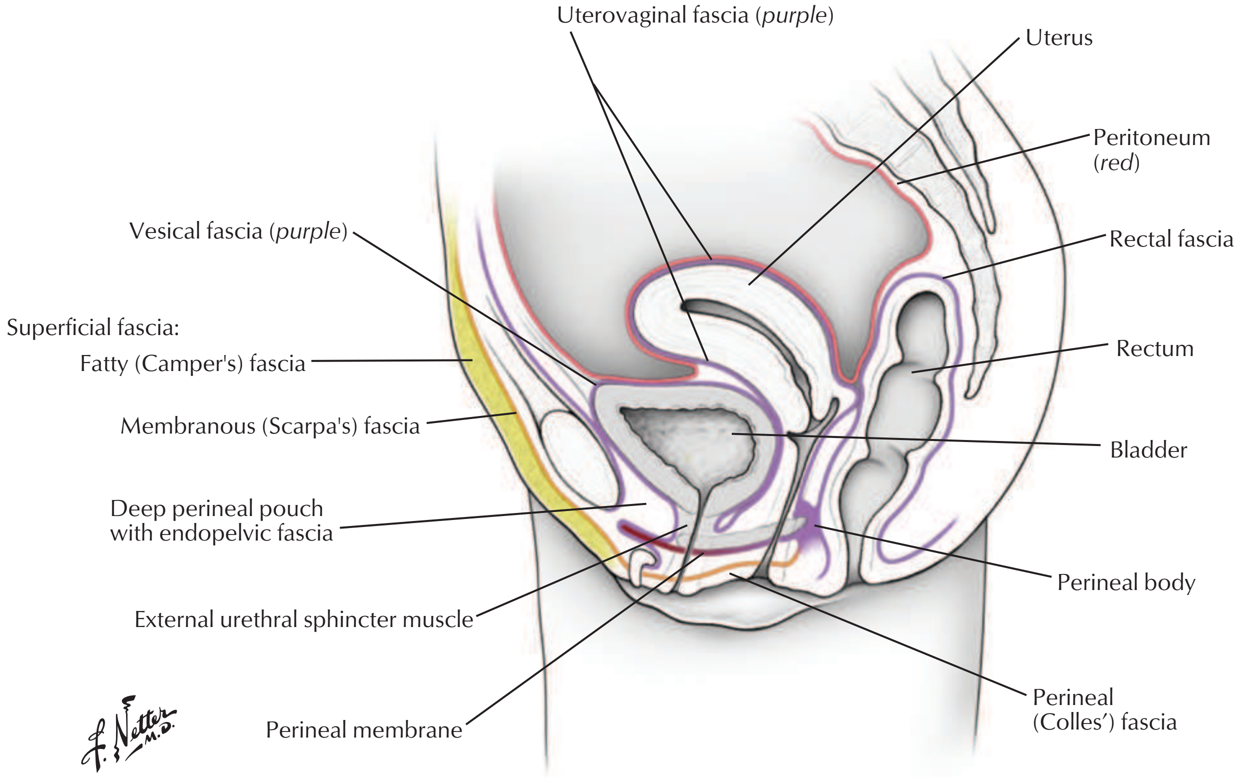
MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Bulbospongiosus	Perineal	*Male:* median raphe, bulb of penis, perineal body *Female:* perineal body	*Male:* perineal membrane, corpus cavernosum, bulb of penis *Female:* dorsum of clitoris, inferior fascia of urogenital diaphragm, bulb of vestibule, pubic arch	Deep branch of perineal nerve from pudendal nerve	Internal pudendal artery and its branch (perineal artery)	*Male:* compresses bulb of penis, forces blood into body of penis during erection, removes urine from urethra and semen during ejaculation *Female:* constricts vaginal orifice, assists in expressing secretions of greater vestibular gland, forces blood into body of clitoris
Coccygeus	Pelvic floor	Ischial spine, sacrospinous ligament	Inferior sacrum, coccyx	Anterior rami of lower sacral nerves	Inferior gluteal artery	Supports pelvic viscera, draws coccyx forward
Compressor urethrae (female only)	Perineal	Ischiopubic ramus	Anterior aspect of urethra	Perineal branches of pudendal nerve	Perineal branch of internal pudendal artery	Sphincter of urethra
Cremaster	Spermatic cord	Lower edge of internal abdominal oblique and middle of inguinal ligament	Pubic tubercle, crest of pubis	Genital branch of genitofemoral nerve	Cremasteric branch of inferior epigastric artery	Retracts testicle
Deep transverse perineal	Perineal	Inner surface of inferior ischial rami	*Male:* medial tendinous raphe and perineal body *Female:* sides of vagina	Perineal branches of pudendal nerve	Perineal branch of internal pudendal artery	Stabilizes perineal body, supports prostate gland/vagina
External anal sphincter	Perineal	Tip of coccyx, anococcygeal ligament	Deeper fibers surround anal canal, attach posteriorly to coccyx and anteriorly to central point of perineum	Perineal and inferior rectal branches of pudendal nerve	Inferior rectal and transverse perineal artery	Closes anal orifice
Iliacus	Anterior thigh	Superior 2/3 of iliac fossa, ala of sacrum, anterior sacroiliac ligaments	Lesser trochanter of femur and body inferior to it, to psoas major tendon	Femoral nerve	Iliac branches of iliolumbar artery	Flexes thigh at hips and stabilizes hip joint, acts with psoas major
Ischiocavernosus	Perineal	Inferior internal surface of ischiopubic ramus, ischial tuberosity	Crus of penis or clitoris	Deep branch of perineal nerve from pudendal nerve	Internal pudendal artery and its branch (perineal artery)	Forces blood into body of penis and clitoris during erection
Levator ani (iliococcygeus, pubococcygeus, and puboanalis)	Pelvic floor	Body of pubis, tendinous arch of obturator fascia, ischial spine	Perineal body, coccyx, anococcygeal raphe, walls of prostate gland or vagina, rectum, anal canal	Anterior rami of lower sacral nerves, perineal nerve	Inferior gluteal artery, internal pudendal artery and its branches (inferior rectal and perineal arteries)	Supports pelvic viscera, raises pelvic floor
Obturator internus	Gluteal region	Pelvic surface of obturator membrane and surrounding bone	Medial surface of greater trochanter of femur	Nerve to obturator internus muscle	Internal pudendal and obturator arteries	Laterally rotates extended thigh, abducts flexed thigh at hip
Piriformis	Gluteal region	Anterior surface of sacral segments 2–4, sacrotuberous ligament	Superior border of greater trochanter of femur	Anterior rami of L5, S1, S2	Superior and inferior gluteal arteries, internal pudendal artery	Laterally rotates extended thigh, abducts flexed thigh at hip

Variations in spinal nerve contributions to the innervation of muscles, their arterial supply, their attachments, and their actions are common themes in human anatomy. Therefore, expect differences between texts and realize that anatomical variation is normal.

MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Sphincter urethrae	Perineal	External fibers from junction of inferior pubic and ischial rami and adjacent fascia; internal fibers pass medially to surround membranous urethra	*Male:* median raphe in front and behind urethra *Female:* encloses urethra, attaches to sides of vagina	Perineal branches of pudendal nerve	Perineal branch of internal pudendal artery	Compresses urethra at end of micturition; in female also compresses distal vagina
Sphincter urethrovaginalis (female only)	Perineal	Perineal body	Passes forward and anteriorly around urethra	Perineal branches of pudendal nerve	Perineal branch of pudendal artery	Sphincter of urethra and vagina
Superficial transverse perineal	Perineal	Ischial rami and tuberosities	Central tendon (perineal body)	Perineal branches of pudendal nerve	Perineal branch of internal pudendal artery	Stabilizes central tendon


Superficial fascia:
Fatty (Camper's) fascia
Membranous (Scarpa's) fascia
Deep (Buck's) fascia of penis (*purple*)
Superficial penile fascia and dartos fascia of scrotum (*yellow*)
Peritoneum (*red*)
Rectum
Bladder
External urethral sphincter muscle
Perineal membrane
Superficial perineal pouch
Perineal (Colles') fascia

Median section of male


Uterovaginal fascia (*purple*)
Uterus
Peritoneum (*red*)
Vesical fascia (*purple*)
Rectal fascia
Superficial fascia:
Fatty (Camper's) fascia
Rectum
Membranous (Scarpa's) fascia
Bladder
Deep perineal pouch with endopelvic fascia
Perineal body
External urethral sphincter muscle
Perineal membrane
Perineal (Colles') fascia
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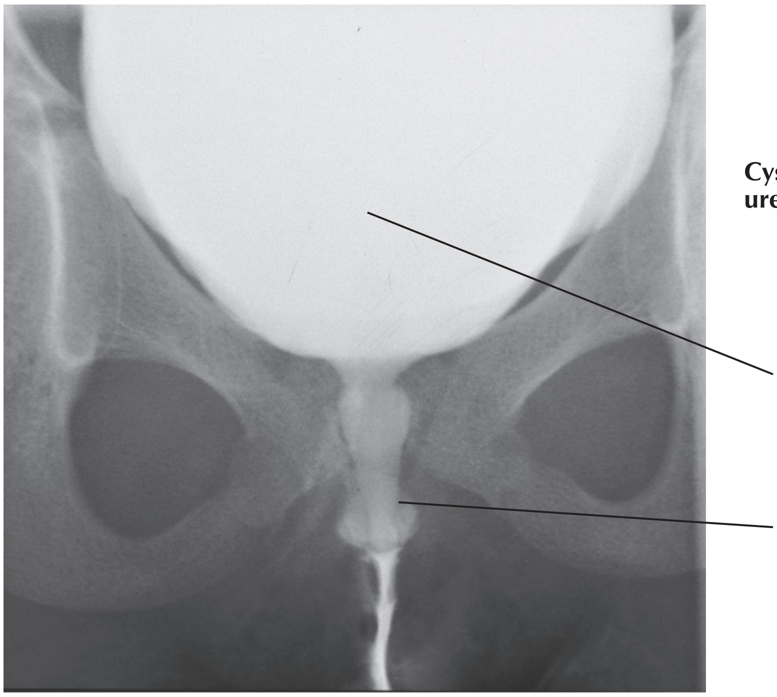
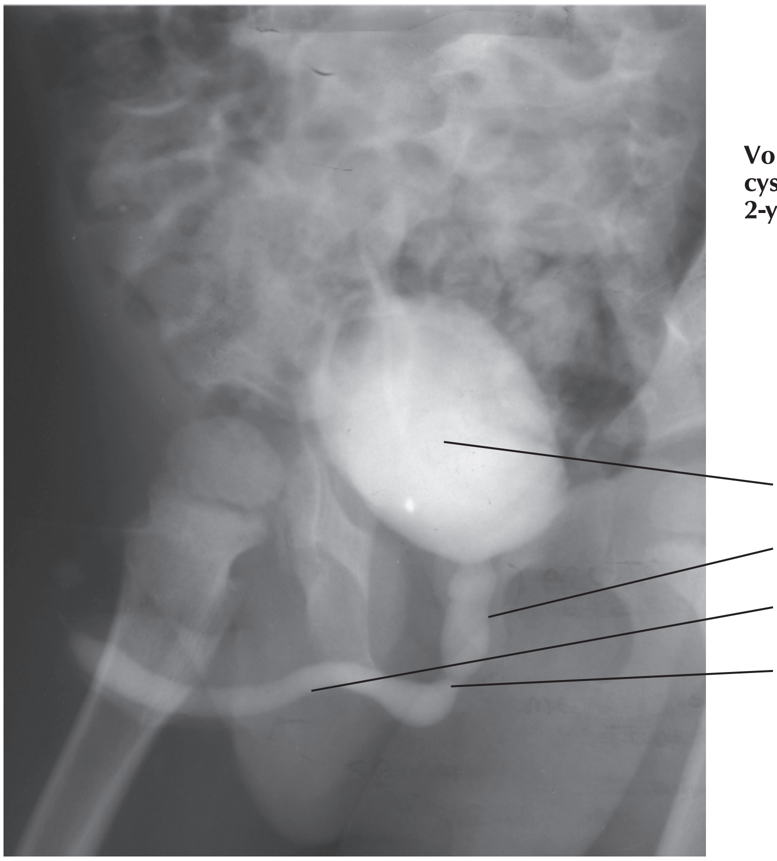
Median section of female



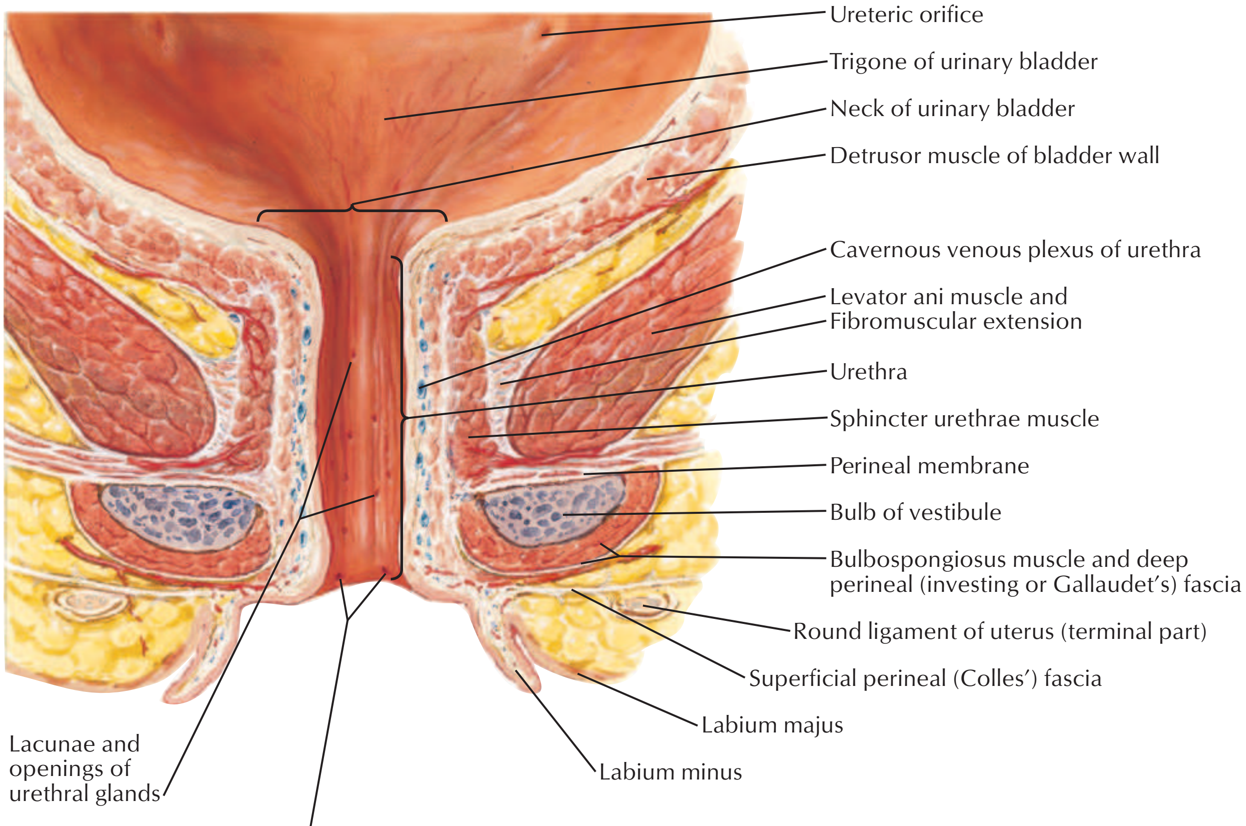
Cystourethrogram of urethra in 8-year-old girl

Bladder
Urethra

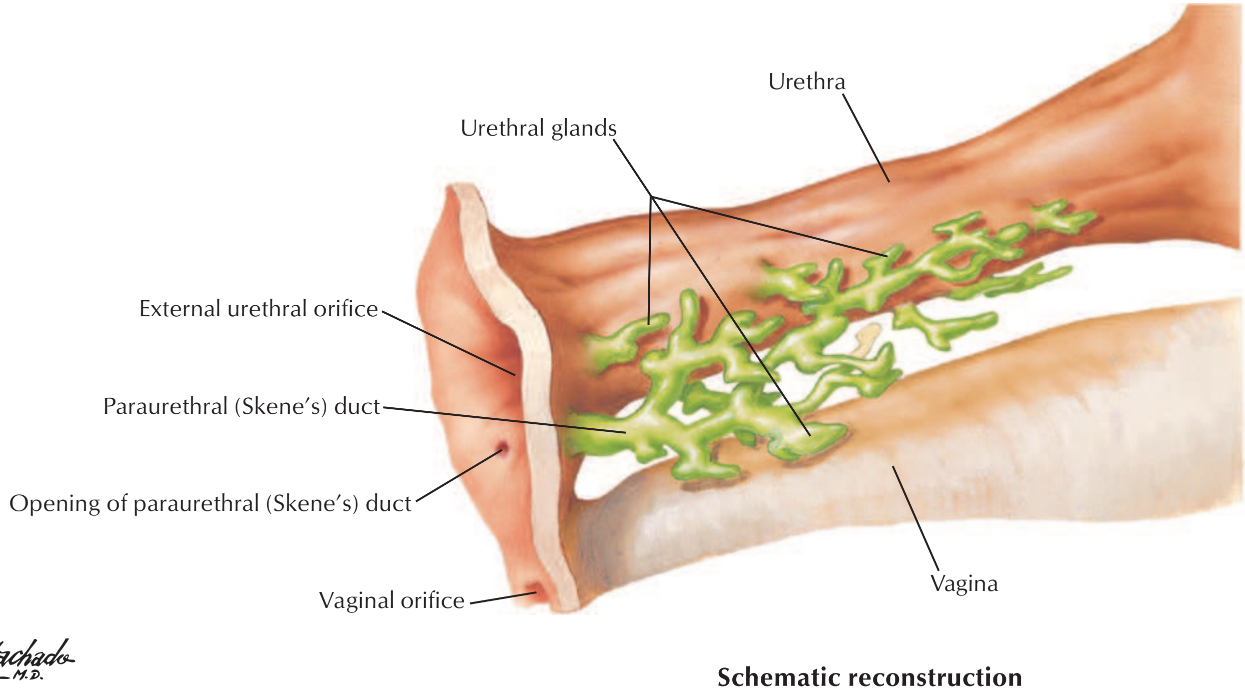


Voiding cystourethrogram in 2-year-old boy

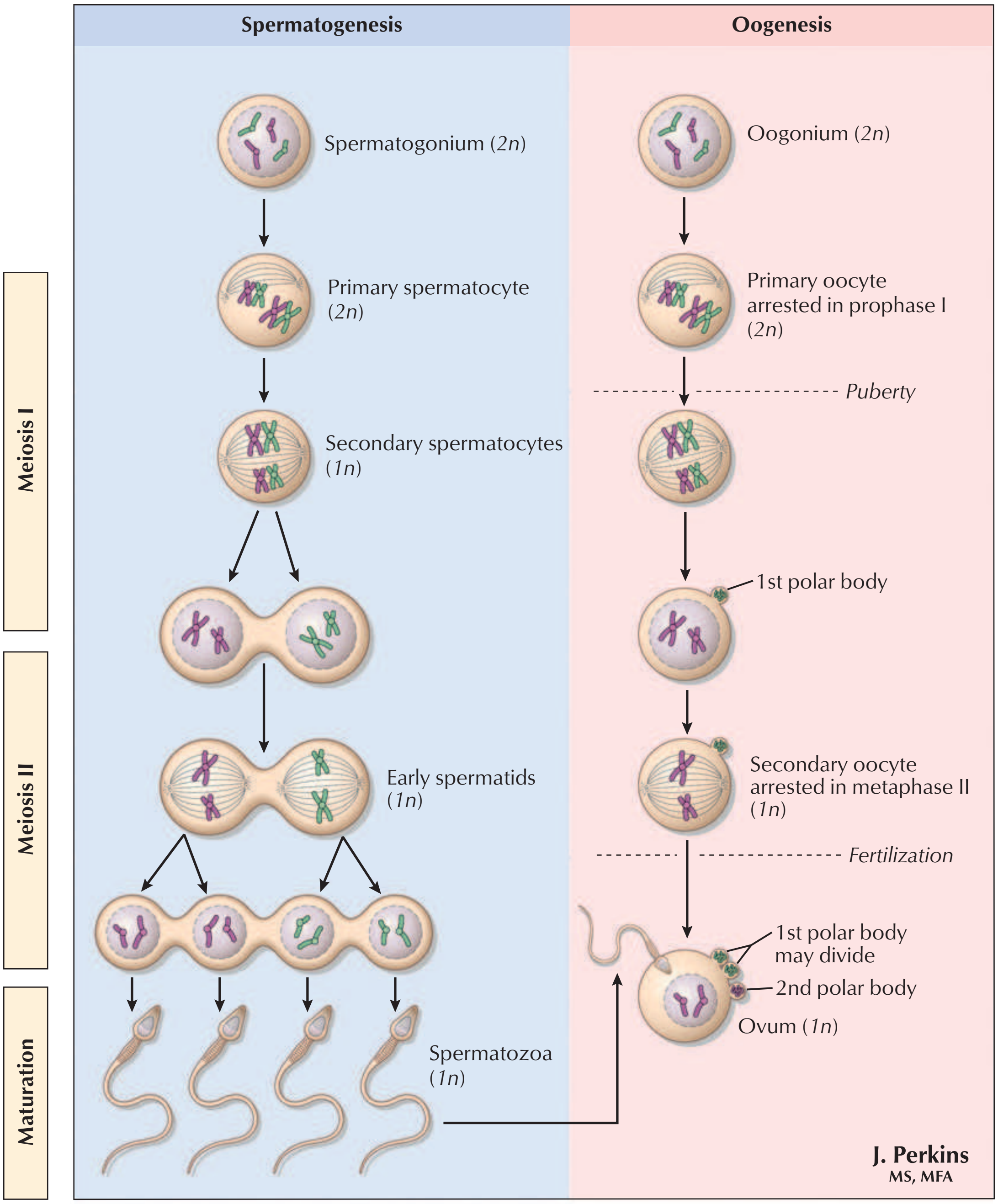
Bladder
Prostatic urethra
Spongy urethra
Membranous urethra


Ureteric orifice
Trigone of urinary bladder
Neck of urinary bladder
Detrusor muscle of bladder wall
Cavernous venous plexus of urethra
Levator ani muscle and
Fibromuscular extension
Urethra
Sphincter urethrae muscle
Perineal membrane
Bulb of vestibule
Bulbospongiosus muscle and deep perineal (investing or Gallaudet's) fascia
Round ligament of uterus (terminal part)
Superficial perineal (Colles') fascia
Labium majus
Labium minus
Lacunae and openings of urethral glands
Openings of paraurethral (Skene's) ducts

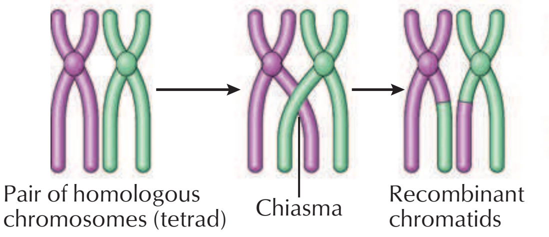
Frontal section, anterior view


Urethra
Urethral glands
External urethral orifice
Paraurethral (Skene's) duct
Opening of paraurethral (Skene's) duct
Vaginal orifice
Vagina
F. Netter M.D.
C. Machado M.D.

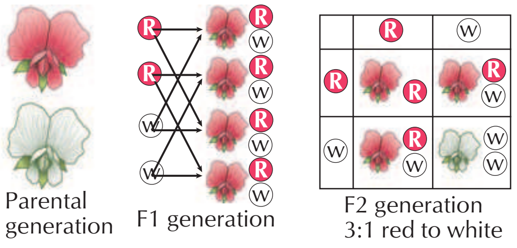
Schematic reconstruction

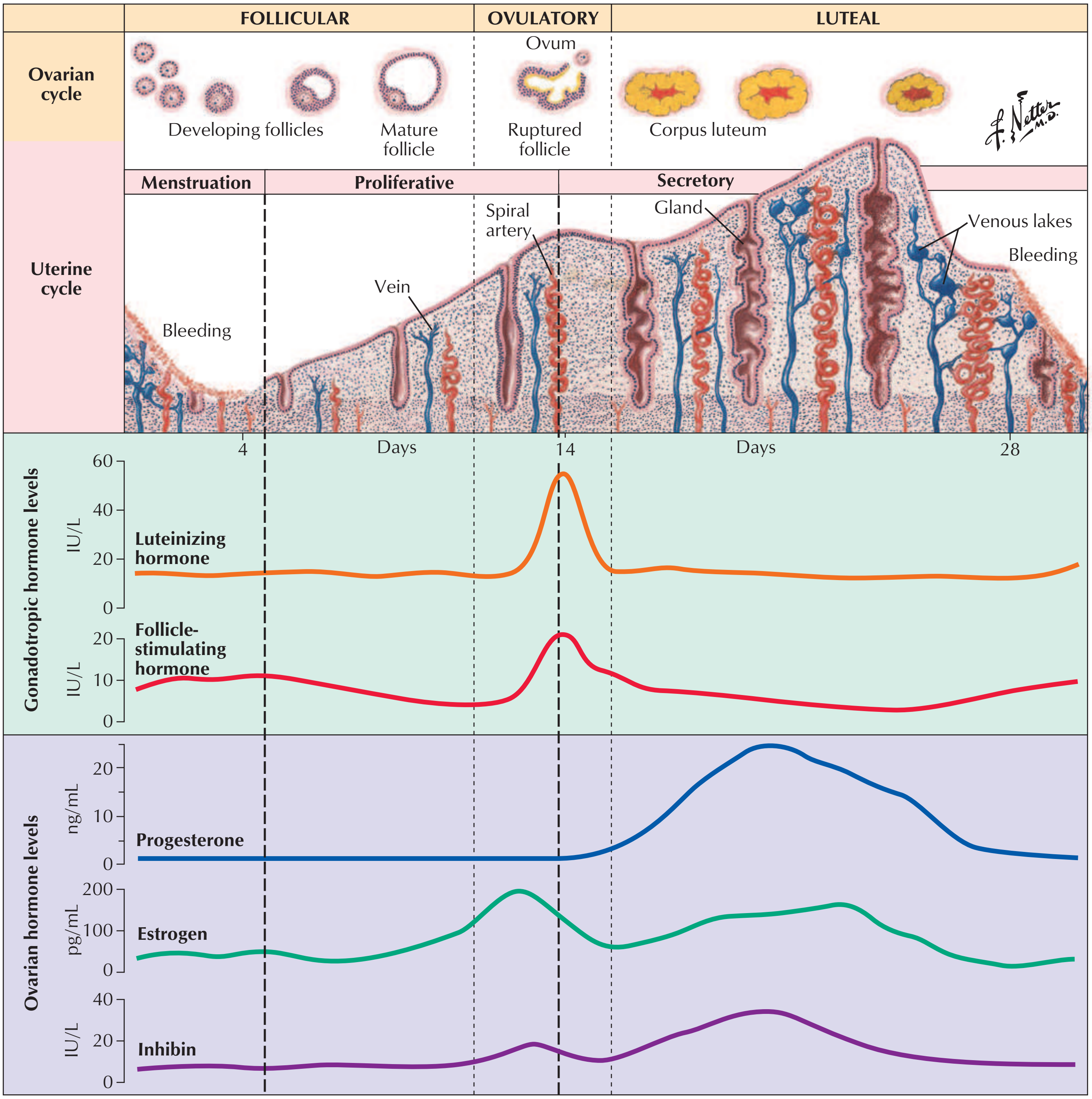

Spermatogenesis
Oogenesis
Meiosis I
Meiosis II
Maturation
Spermatogonium (2n)
Primary spermatocyte (2n)
Secondary spermatocytes (1n)
Early spermatids (1n)
Spermatozoa (1n)
Oogonium (2n)
Primary oocyte arrested in prophase I (2n)
Puberty
1st polar body
Secondary oocyte arrested in metaphase II (1n)
Fertilization
1st polar body may divide
2nd polar body
Ovum (1n)
J. Perkins
MS, MFA

Crossing over


Pair of homologous chromosomes (tetrad)
Chiasma
Recombinant chromatids

Mendelian inheritance


Parental generation
R
R
W
W
R
W
R
W
R
W
R
W
F1 generation
R
W
R
R
R
R
W
W
R
W
W
W
F2 generation
3:1 red to white


FOLLICULAR
OVULATORY
LUTEAL
Ovarian cycle
Developing follicles
Mature follicle
Ovum
Ruptured follicle
Corpus luteum
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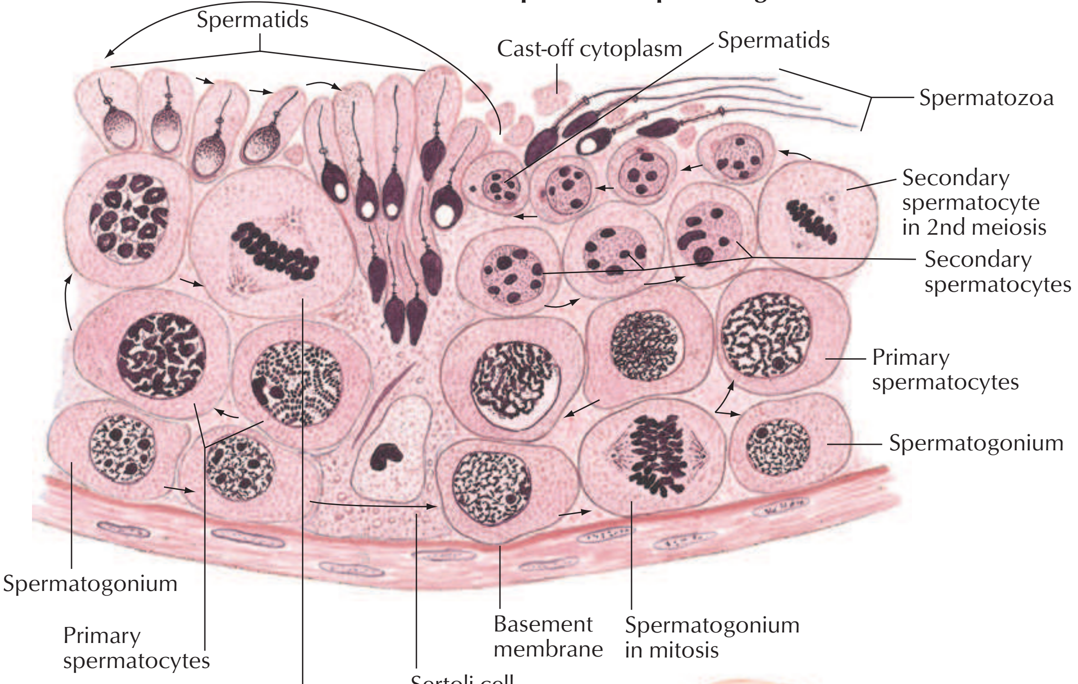
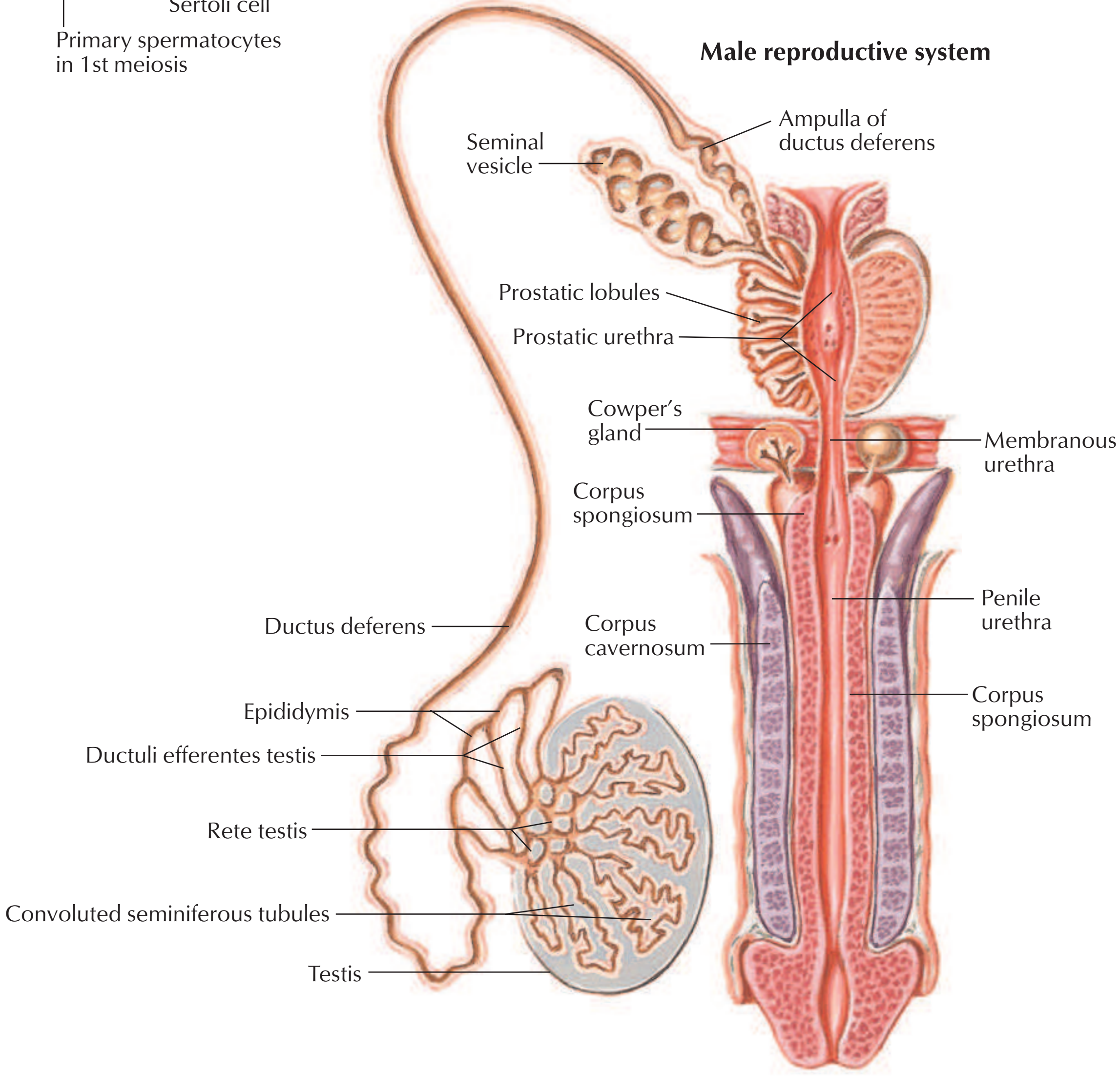
Menstruation
Proliferative
Secretory
Uterine cycle
Bleeding
Vein
Spiral artery
Gland
Venous lakes
Bleeding
4
Days
14
Days
28
Gonadotropic hormone levels
IU/L
60
40
20
0
Luteinizing hormone
IU/L
20
10
0
Follicle-stimulating hormone
Ovarian hormone levels
ng/mL
20
10
0
Progesterone
pg/mL
200
100
0
Estrogen
IU/L
40
20
0
Inhibin

Seminiferous epithelium: spermatogenesis


Spermatids
Cast-off cytoplasm
Spermatids
Spermatozoa
Secondary spermatocyte in 2nd meiosis
Secondary spermatocytes
Primary spermatocytes
Spermatogonium
Spermatogonium
Primary spermatocytes
Basement membrane
Spermatogonium in mitosis
Sertoli cell
Primary spermatocytes in 1st meiosis

Male reproductive system


Seminal vesicle
Ampulla of ductus deferens
Prostatic lobules
Prostatic urethra
Cowper's gland
Membranous urethra
Corpus spongiosum
Penile urethra
Ductus deferens
Corpus cavernosum
Corpus spongiosum
Epididymis
Ductuli efferentes testis
Rete testis
Convoluted seminiferous tubules
Testis

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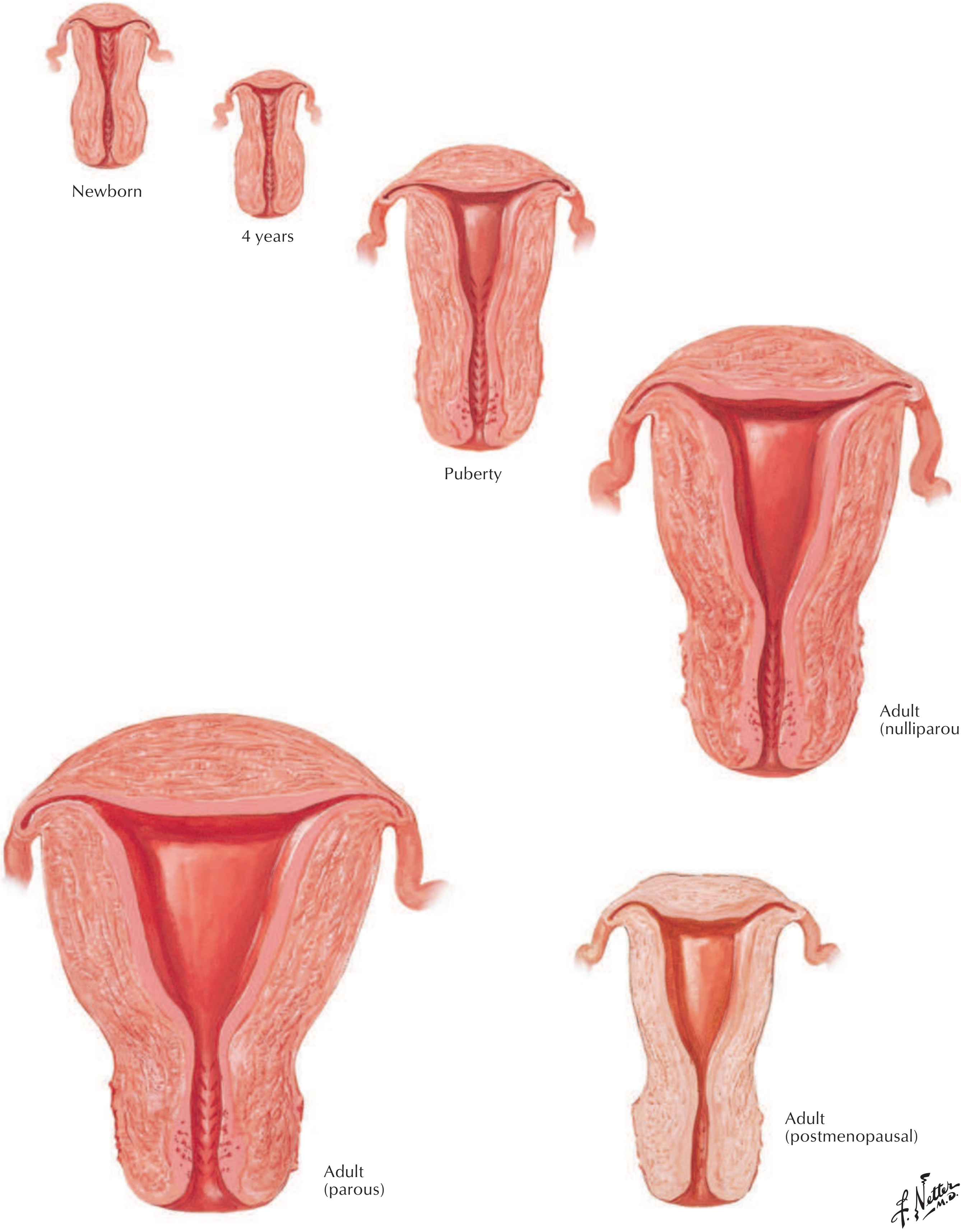
JOHN A.CRAIG—MD

Uterine Development



Newborn

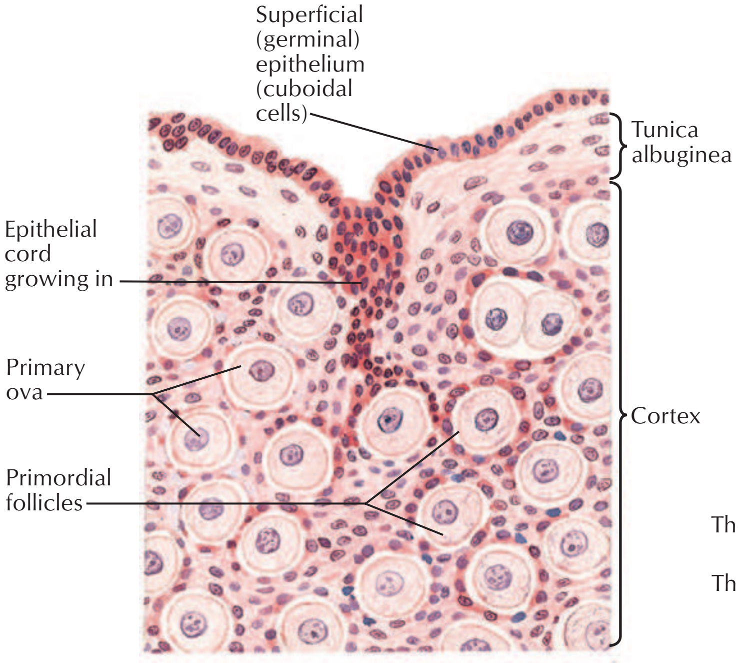
4 years

Puberty

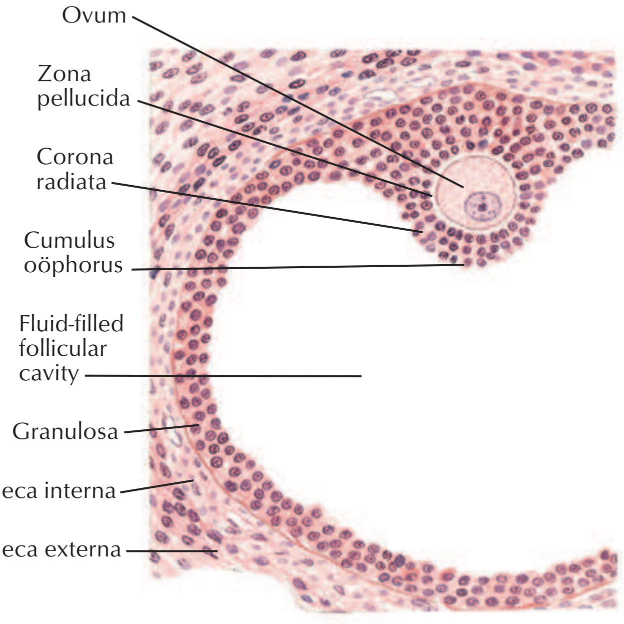
Adult (nulliparous)

Adult (parous)

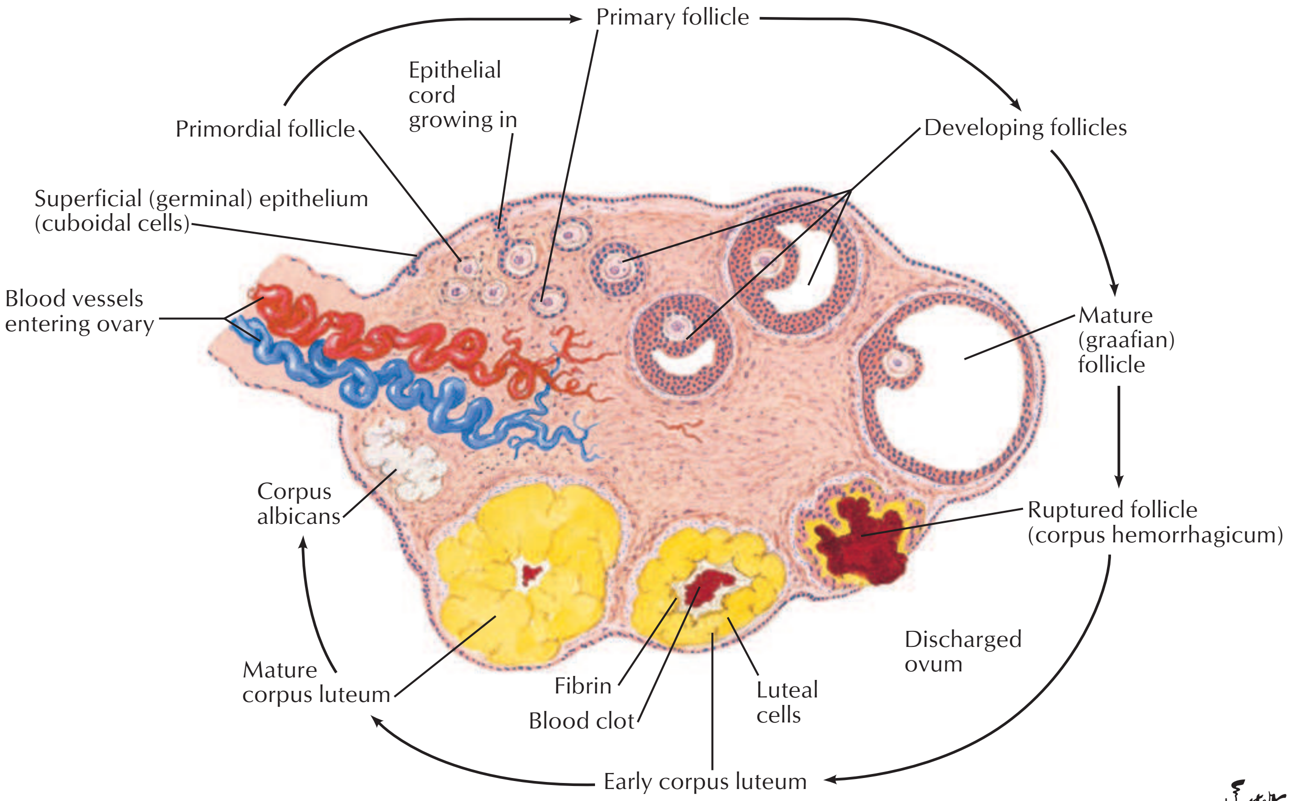
Adult (postmenopausal)


Superficial (germinal) epithelium (cuboidal cells)
Tunica albuginea
Epithelial cord growing in
Primary ova
Cortex
Primordial follicles

Infant ovary

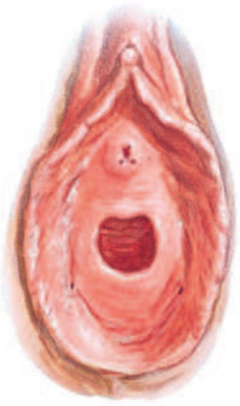

Ovum
Zona pellucida
Corona radiata
Cumulus oöphorus
Fluid-filled follicular cavity
Granulosa
Theca interna
Theca externa

Ripening follicle

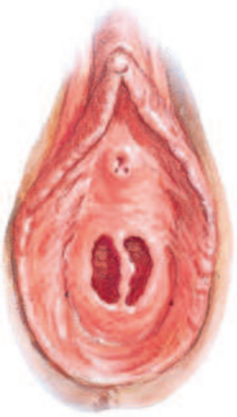

Primary follicle
Epithelial cord growing in
Primordial follicle
Developing follicles
Superficial (germinal) epithelium (cuboidal cells)
Blood vessels entering ovary
Mature (graafian) follicle
Corpus albicans
Ruptured follicle (corpus hemorrhagicum)
Discharged ovum
Mature corpus luteum
Fibrin
Blood clot
Luteal cells
Early corpus luteum

Stages of ovum and follicle

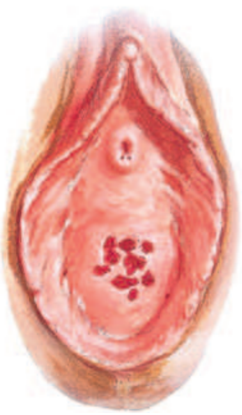
Variations in Hymen



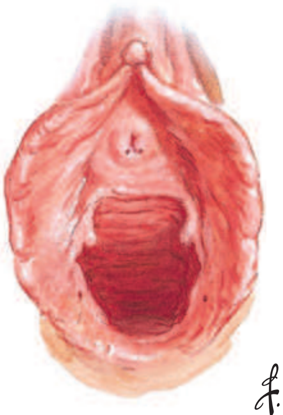
Annular hymen



Septate hymen



Cribriform hymen



Parous introitus

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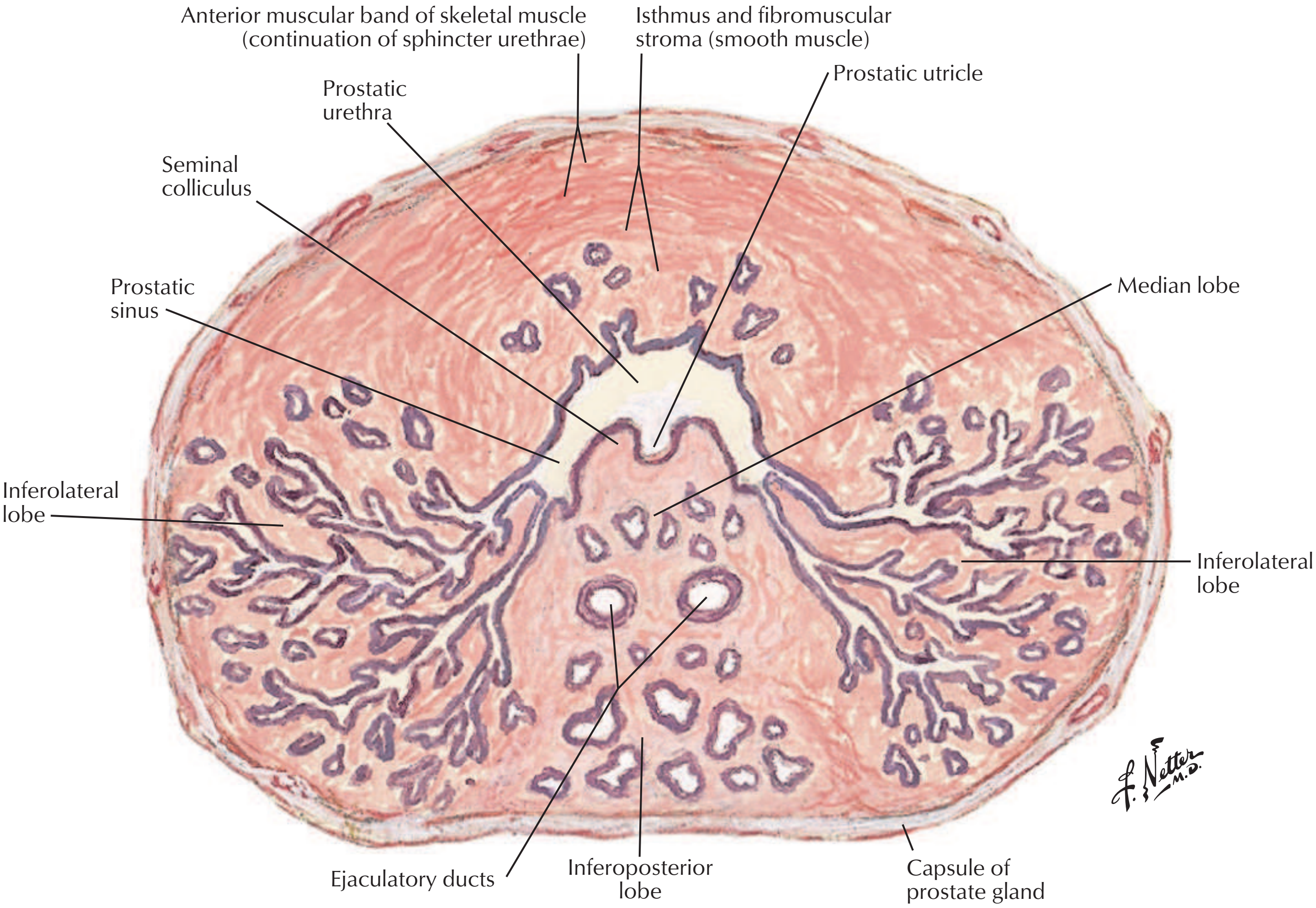
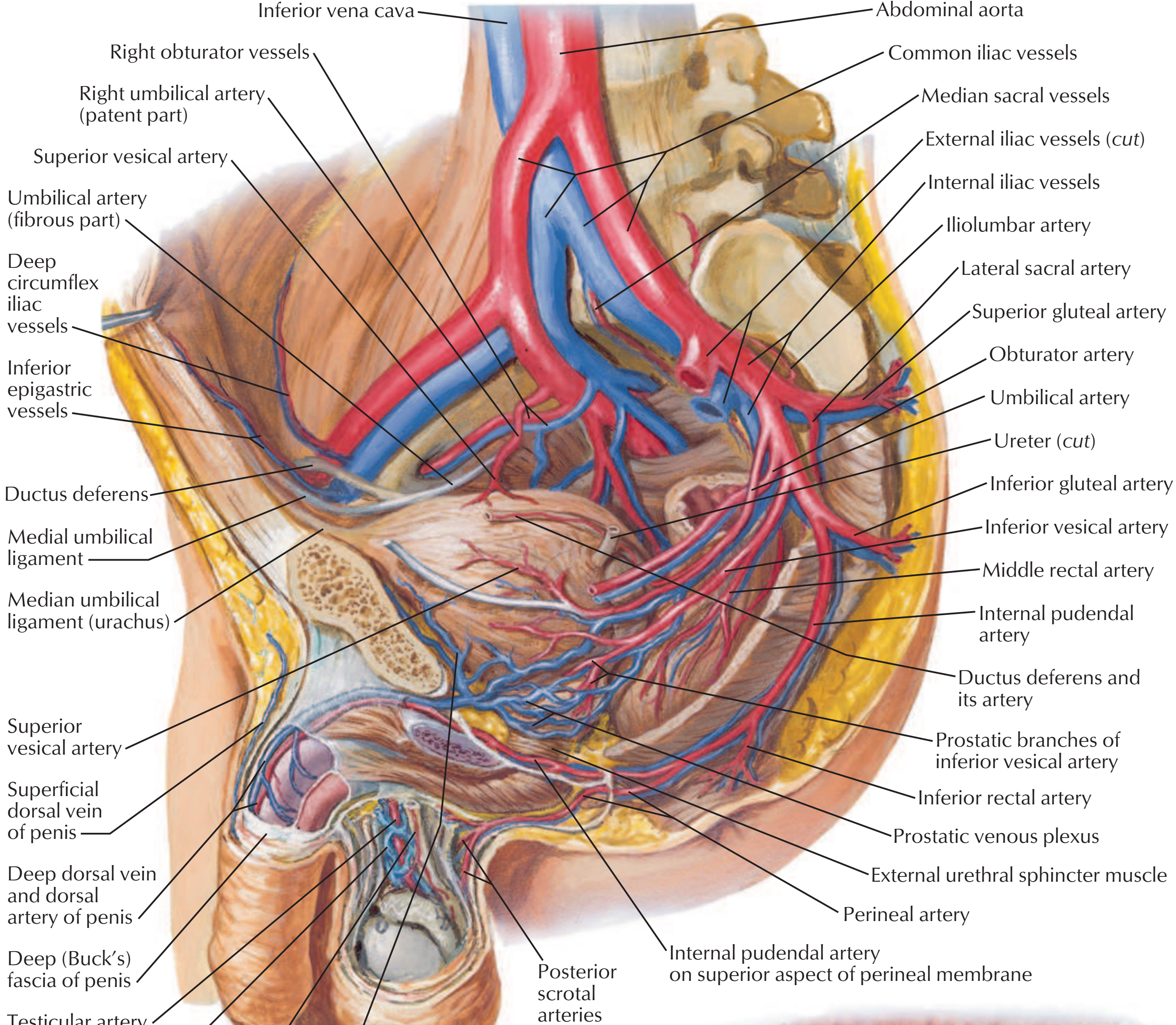
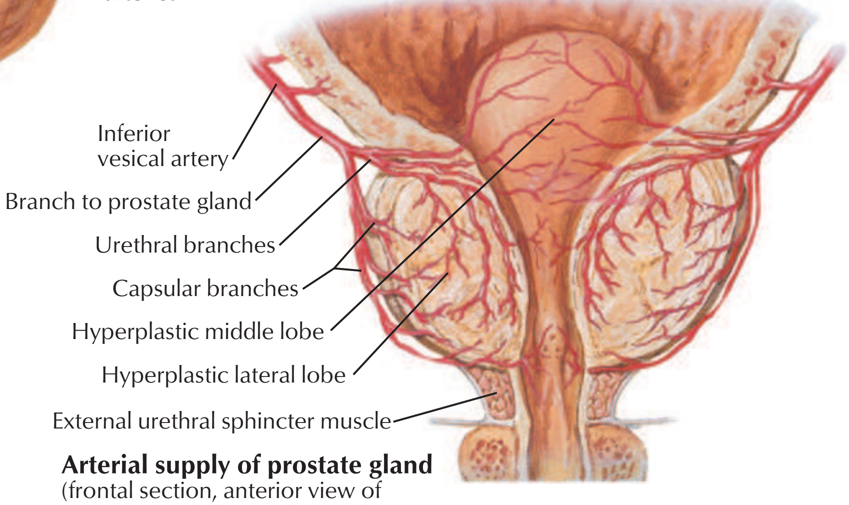
Cross Section Through Prostate


Anterior muscular band of skeletal muscle (continuation of sphincter urethrae)
Isthmus and fibromuscular stroma (smooth muscle)
Prostatic utricle
Prostatic urethra
Seminal colliculus
Prostatic sinus
Median lobe
Inferolateral lobe
Inferolateral lobe
Ejaculatory ducts
Inferoposterior lobe
Capsule of prostate gland

Left paramedian section: lateral view


Inferior vena cava
Abdominal aorta
Right obturator vessels
Common iliac vessels
Right umbilical artery (patent part)
Median sacral vessels
Superior vesical artery
External iliac vessels (*cut*)
Umbilical artery (fibrous part)
Internal iliac vessels
Iliolumbar artery
Deep circumflex iliac vessels
Lateral sacral artery
Superior gluteal artery
Inferior epigastric vessels
Obturator artery
Umbilical artery
Ureter (*cut*)
Ductus deferens
Inferior gluteal artery
Medial umbilical ligament
Inferior vesical artery
Middle rectal artery
Median umbilical ligament (urachus)
Internal pudendal artery
Ductus deferens and its artery
Superior vesical artery
Prostatic branches of inferior vesical artery
Superficial dorsal vein of penis
Inferior rectal artery
Prostatic venous plexus
External urethral sphincter muscle
Deep dorsal vein and dorsal artery of penis
Perineal artery
Deep (Buck's) fascia of penis
Internal pudendal artery on superior aspect of perineal membrane
Posterior scrotal arteries
Testicular artery
Pampiniform (venous) plexus
Artery to ductus deferens
Vesical (retropubic) venous plexus


Inferior vesical artery
Branch to prostate gland
Urethral branches
Capsular branches
Hyperplastic middle lobe
Hyperplastic lateral lobe
External urethral sphincter muscle

Arterial supply of prostate gland
(frontal section, anterior view of specimen with benign hyperplasia)

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C. Machado M.D.

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UPPER LIMB

7

Surface Anatomy 402
Cutaneous Anatomy 403-407
Shoulder and Axilla 408-420
Arm 421-425
Elbow and Forearm 426-441
Wrist and Hand 442-461
Neurovasculature 462-469
Regional Imaging 470
Structures With High Clinical Significance Tables 7.1-7.2
Muscle Tables Tables 7.3-7.6
Electronic Bonus Plates BP99-BP106

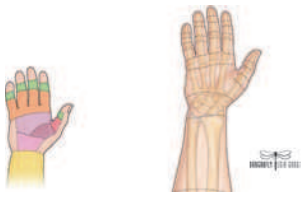
ELECTRONIC BONUS PLATES

BP99 Veins of Upper Limb

BP100 Arteries of Arm and Proximal Forearm

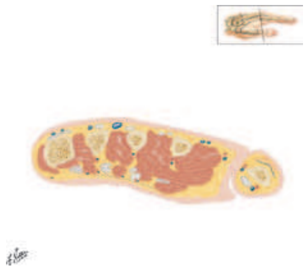
BP101 Arteries of Forearm and Hand

BP102 Ligaments of Wrist



BP103 Flexor and Extensor Zones of Hand

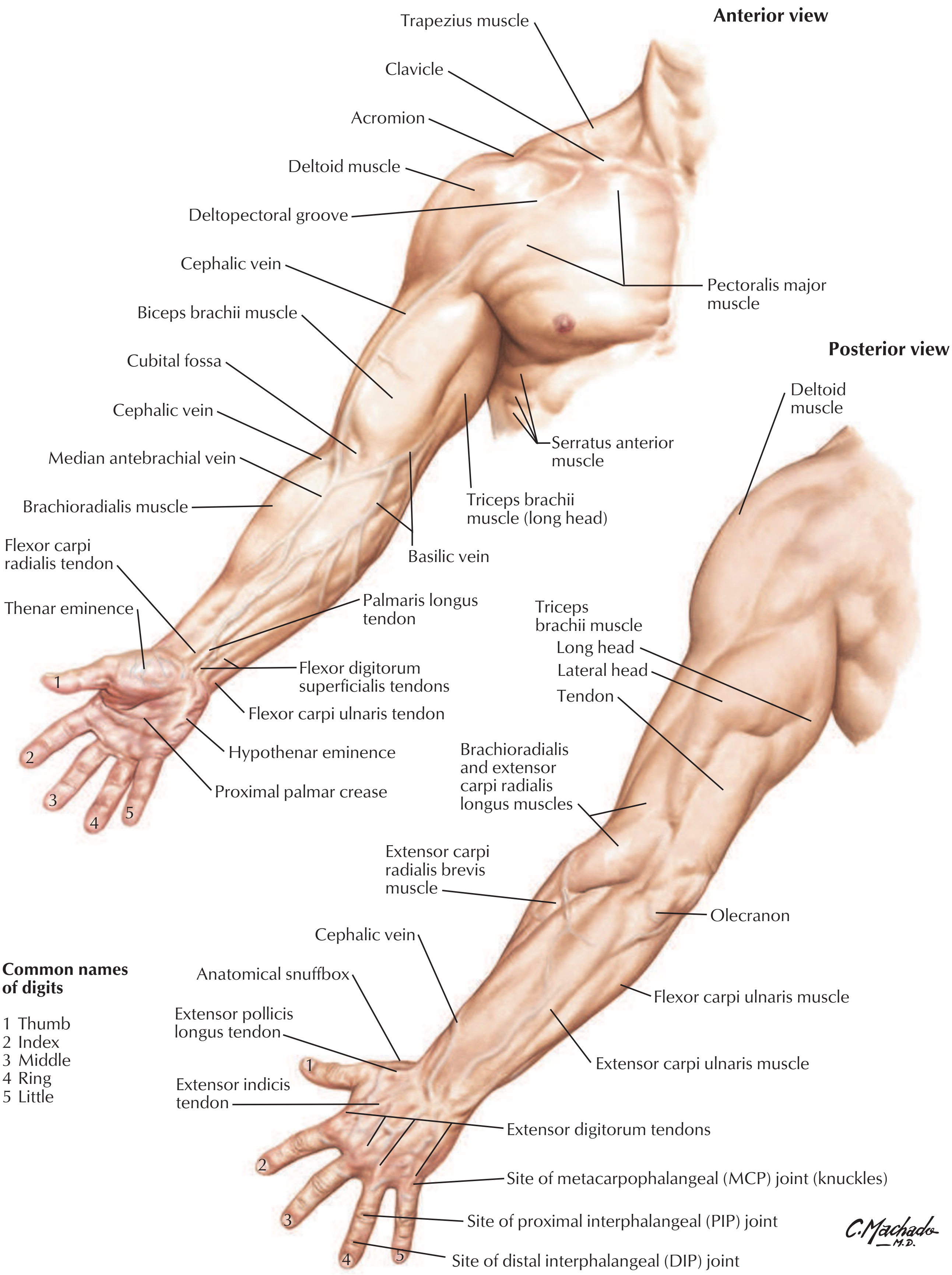
BP104 Section Through Metacarpal and Distal Carpal Bones



BP105 Cross Section of Hand: Axial View

BP106 Cross Section of Hand: Axial View (continued)

See also Plates 161, 249, 403


Anterior view
Trapezius muscle
Clavicle
Acromion
Deltoid muscle
Deltopectoral groove
Cephalic vein
Biceps brachii muscle
Cubital fossa
Cephalic vein
Median antebrachial vein
Brachioradialis muscle
Flexor carpi radialis tendon
Thenar eminence
Pectoralis major muscle
Serratus anterior muscle
Triceps brachii muscle (long head)
Basilic vein
Palmaris longus tendon
Flexor digitorum superficialis tendons
Flexor carpi ulnaris tendon
Hypothenar eminence
Proximal palmar crease
1
2
3
4
5
Posterior view
Deltoid muscle
Triceps brachii muscle
Long head
Lateral head
Tendon
Brachioradialis and extensor carpi radialis longus muscles
Extensor carpi radialis brevis muscle
Olecranon
Cephalic vein
Anatomical snuffbox
Extensor pollicis longus tendon
Extensor indicis tendon
Flexor carpi ulnaris muscle
Extensor carpi ulnaris muscle
Extensor digitorum tendons
Site of metacarpophalangeal (MCP) joint (knuckles)
Site of proximal interphalangeal (PIP) joint
Site of distal interphalangeal (DIP) joint
1
2
3
4
5
C.Machado M.D.

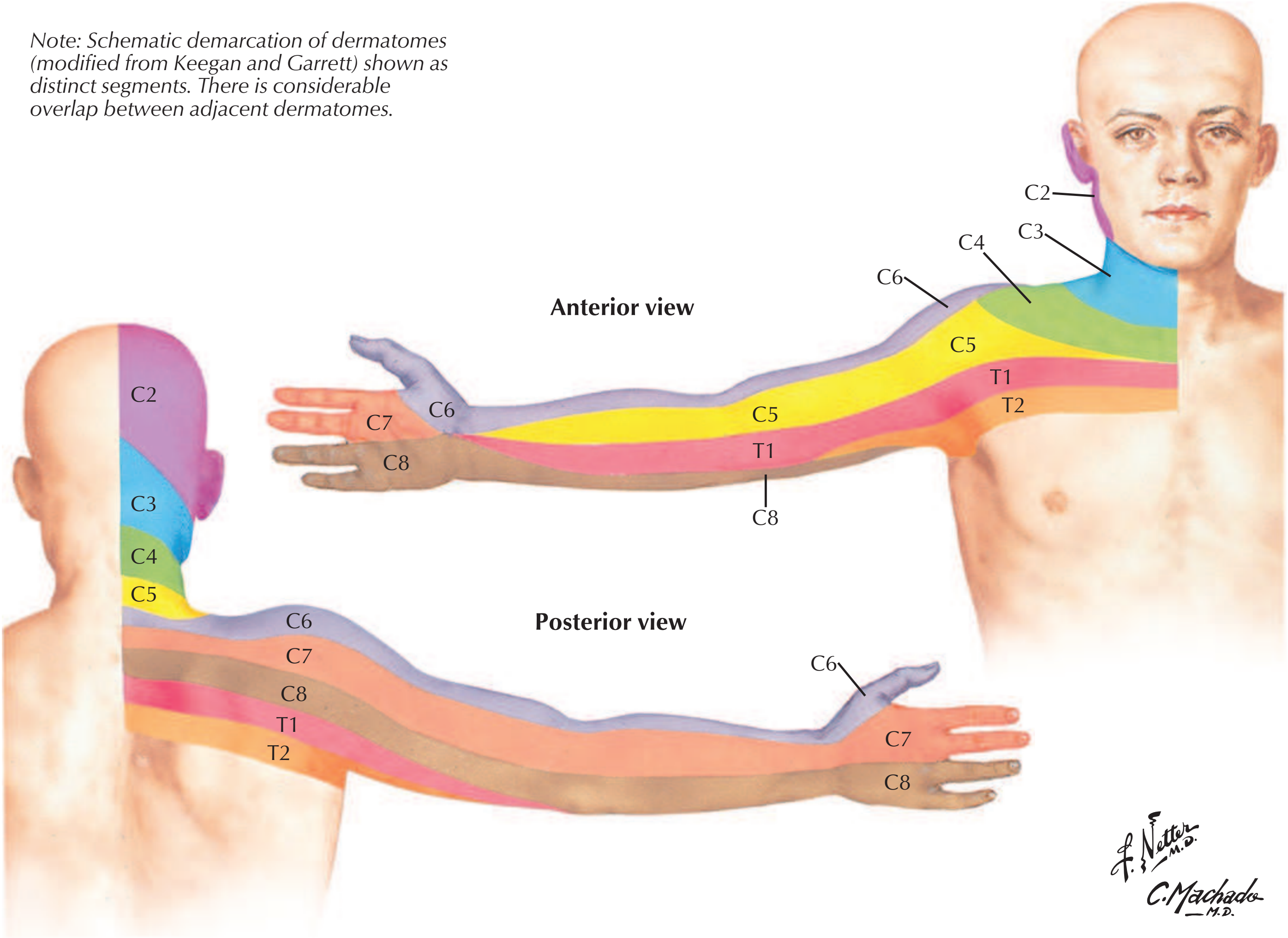
Common names of digits

1 Thumb
2 Index
3 Middle
4 Ring
5 Little

Dermatomes of Upper Limb and Segmental Nerve Function

See also **Plate 171**

Note: Schematic demarcation of dermatomes (modified from Keegan and Garrett) shown as distinct segments. There is considerable overlap between adjacent dermatomes.


Anterior view
C2
C3
C4
C6
C5
T1
T2
C6
C7
C8
C5
T1
C8
Posterior view
C2
C3
C4
C5
C6
C7
C8
T1
T2
C6
C7
C8
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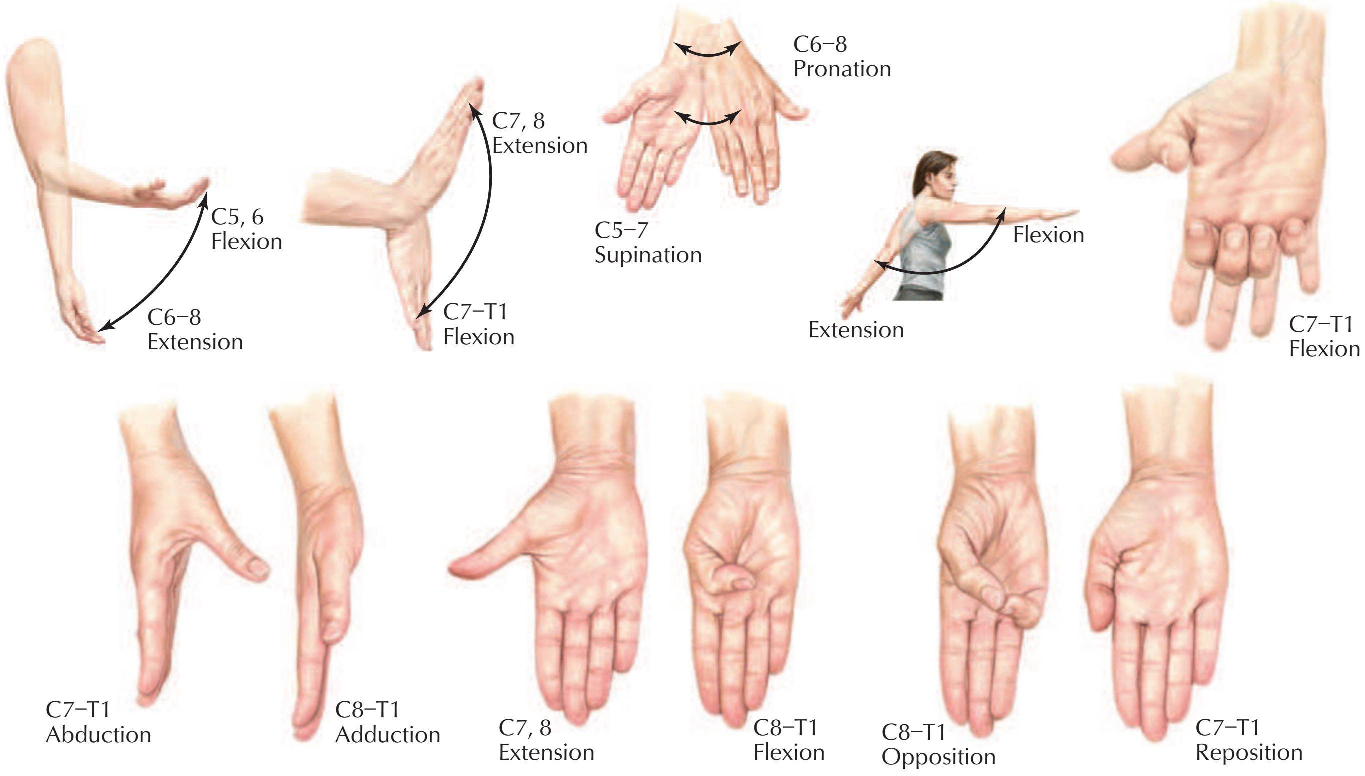
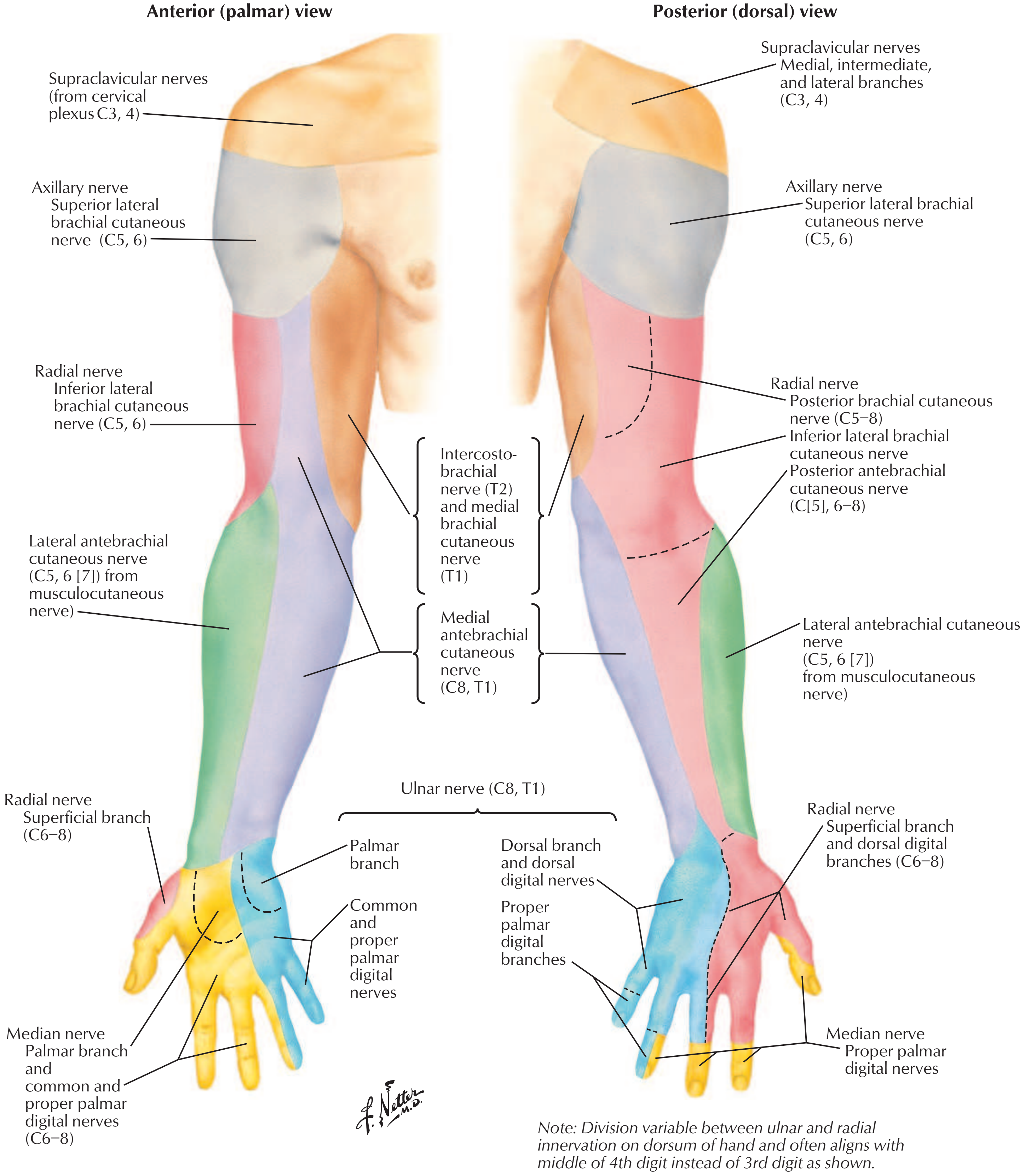
C. Machado M.D.


C5, 6
Flexion
C6–8
Extension
C7, 8
Extension
C7–T1
Flexion
C6–8
Pronation
C5–7
Supination
Flexion
Extension
C7–T1
Flexion
C7–T1
Abduction
C8–T1
Adduction
C7, 8
Extension
C8–T1
Flexion
C8–T1
Opposition
C7–T1
Reposition

See also Plates 172, 462, 464


Anterior (palmar) view
Posterior (dorsal) view
Supraclavicular nerves (from cervical plexus C3, 4)
Axillary nerve Superior lateral brachial cutaneous nerve (C5, 6)
Radial nerve Inferior lateral brachial cutaneous nerve (C5, 6)
Lateral antebrachial cutaneous nerve (C5, 6 [7]) from musculocutaneous nerve)
Radial nerve Superficial branch (C6–8)
Median nerve Palmar branch and common and proper palmar digital nerves (C6–8)
Intercosto-brachial nerve (T2) and medial brachial cutaneous nerve (T1)
Medial antebrachial cutaneous nerve (C8, T1)
Ulnar nerve (C8, T1)
Palmar branch
Common and proper palmar digital nerves
Dorsal branch and dorsal digital nerves
Proper palmar digital branches
Supraclavicular nerves Medial, intermediate, and lateral branches (C3, 4)
Axillary nerve Superior lateral brachial cutaneous nerve (C5, 6)
Radial nerve Posterior brachial cutaneous nerve (C5–8)
Inferior lateral brachial cutaneous nerve
Posterior antebrachial cutaneous nerve (C[5], 6–8)
Lateral antebrachial cutaneous nerve (C5, 6 [7]) from musculocutaneous nerve)
Radial nerve Superficial branch and dorsal digital branches (C6–8)
Median nerve Proper palmar digital nerves
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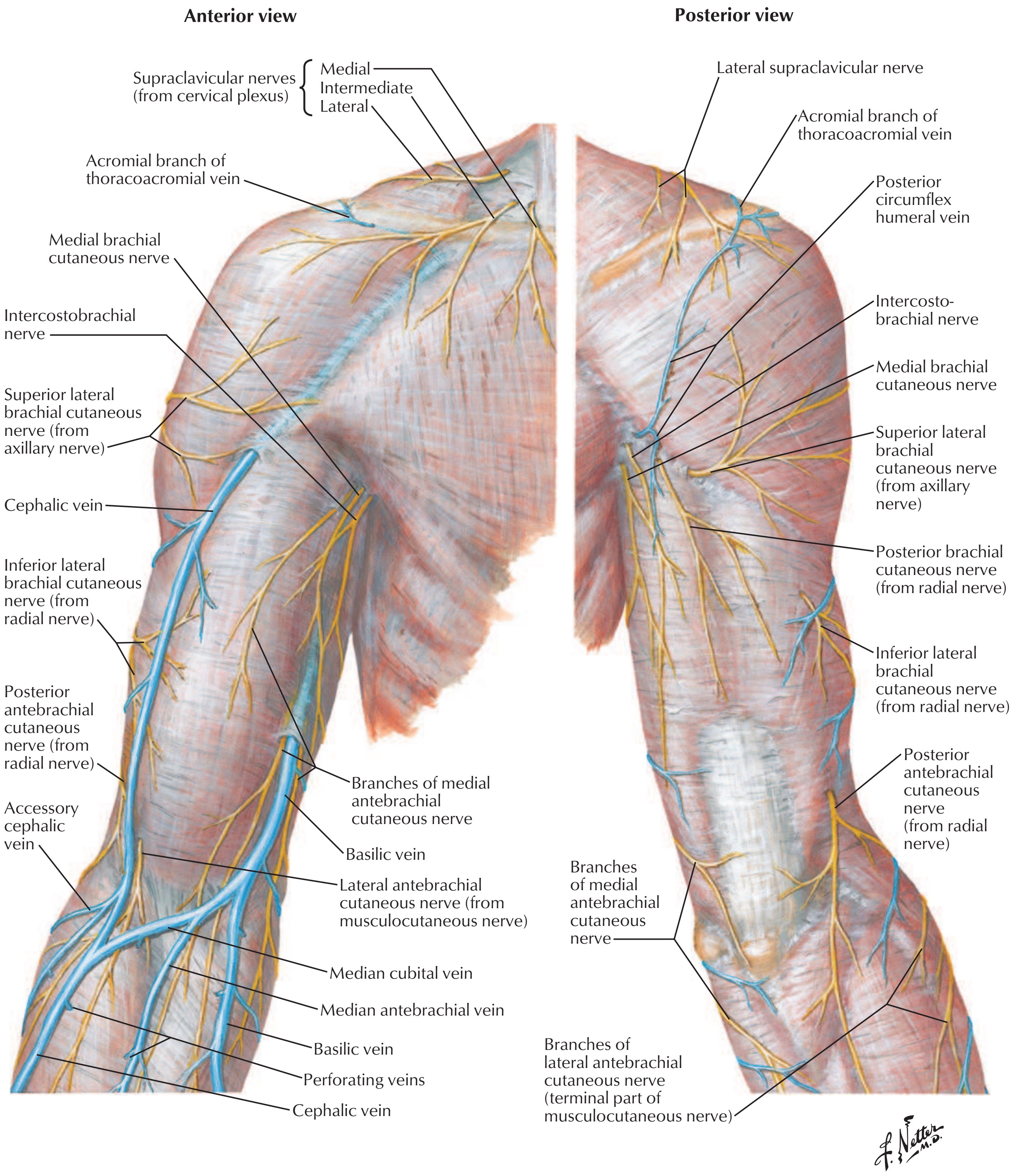
Note: Division variable between ulnar and radial innervation on dorsum of hand and often aligns with middle of 4th digit instead of 3rd digit as shown.

Cutaneous Nerves and Superficial Veins of Proximal Upper Limb

See also Plates 259, 407


Anterior view
Supraclavicular nerves (from cervical plexus)
Medial
Intermediate
Lateral
Acromial branch of thoracoacromial vein
Medial brachial cutaneous nerve
Intercostobrachial nerve
Superior lateral brachial cutaneous nerve (from axillary nerve)
Cephalic vein
Inferior lateral brachial cutaneous nerve (from radial nerve)
Posterior antebrachial cutaneous nerve (from radial nerve)
Accessory cephalic vein
Branches of medial antebrachial cutaneous nerve
Basilic vein
Lateral antebrachial cutaneous nerve (from musculocutaneous nerve)
Median cubital vein
Median antebrachial vein
Basilic vein
Perforating veins
Cephalic vein
Posterior view
Lateral supraclavicular nerve
Acromial branch of thoracoacromial vein
Posterior circumflex humeral vein
Intercosto-brachial nerve
Medial brachial cutaneous nerve
Superior lateral brachial cutaneous nerve (from axillary nerve)
Posterior brachial cutaneous nerve (from radial nerve)
Inferior lateral brachial cutaneous nerve (from radial nerve)
Posterior antebrachial cutaneous nerve (from radial nerve)
Branches of medial antebrachial cutaneous nerve
Branches of lateral antebrachial cutaneous nerve (terminal part of musculocutaneous nerve)
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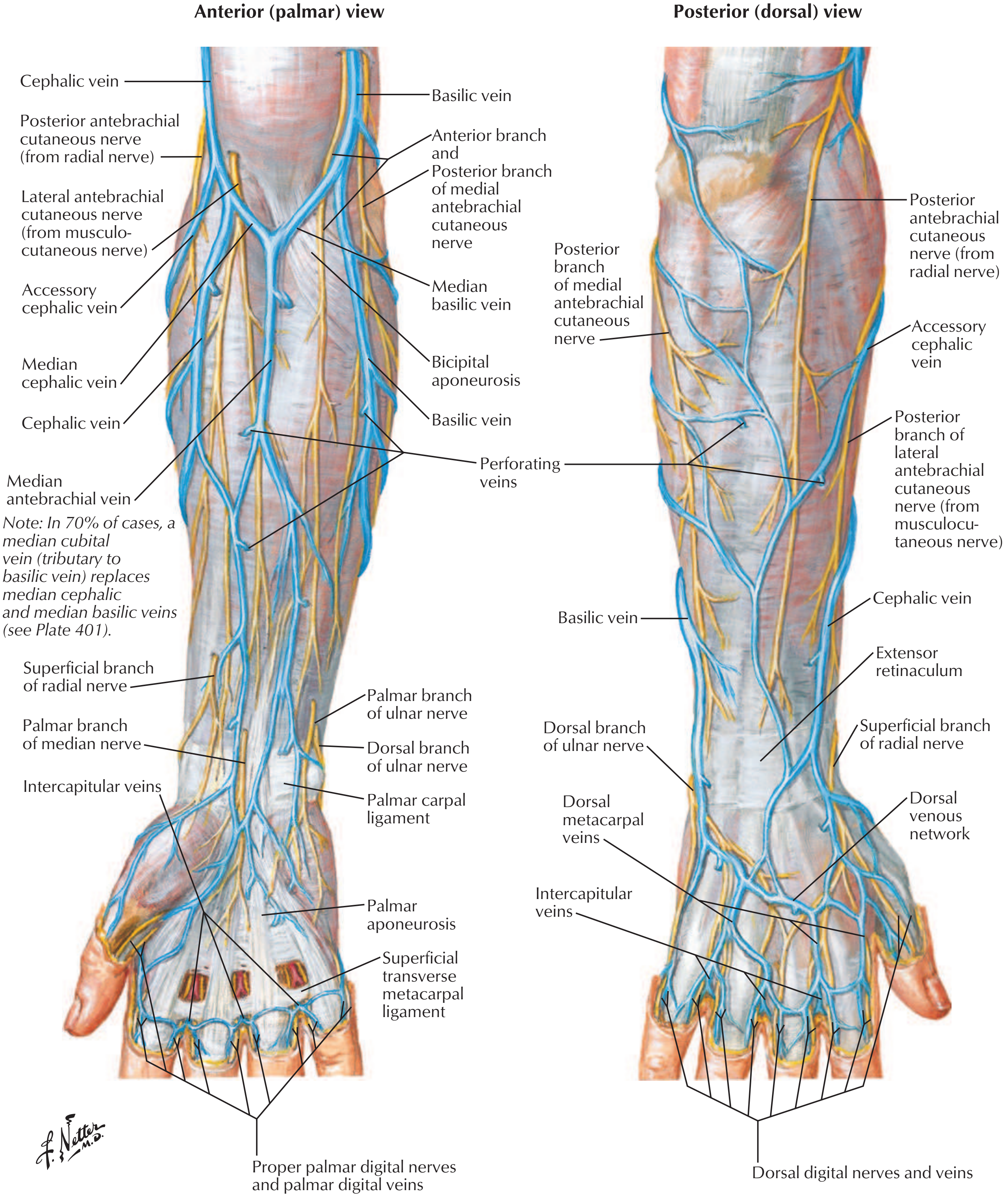
Cutaneous Nerves and Superficial Veins of Forearm and Hand

See also Plates 404, 458


Anterior (palmar) view

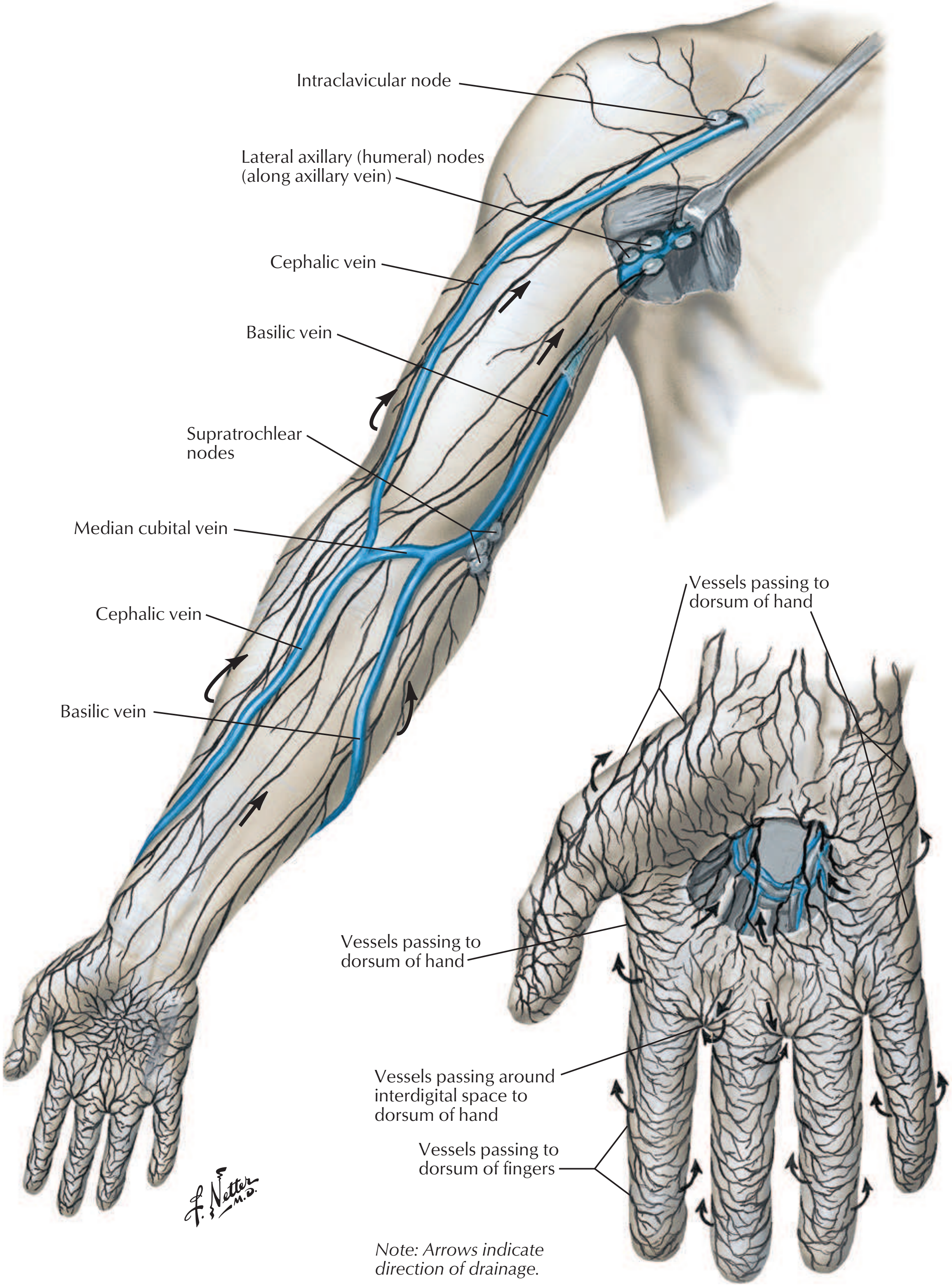
Posterior (dorsal) view

Cephalic vein
Posterior antebrachial cutaneous nerve (from radial nerve)
Lateral antebrachial cutaneous nerve (from musculo-cutaneous nerve)
Accessory cephalic vein
Median cephalic vein
Cephalic vein
Median antebrachial vein
Superficial branch of radial nerve
Palmar branch of median nerve
Intercapitular veins
Basilic vein
Anterior branch and Posterior branch of medial antebrachial cutaneous nerve
Median basilic vein
Bicipital aponeurosis
Basilic vein
Perforating veins
Palmar branch of ulnar nerve
Dorsal branch of ulnar nerve
Palmar carpal ligament
Palmar aponeurosis
Superficial transverse metacarpal ligament
Proper palmar digital nerves and palmar digital veins
F. Netter M.D.
Posterior branch of medial antebrachial cutaneous nerve
Basilic vein
Dorsal branch of ulnar nerve
Dorsal metacarpal veins
Intercapitular veins
Posterior antebrachial cutaneous nerve (from radial nerve)
Accessory cephalic vein
Posterior branch of lateral antebrachial cutaneous nerve (from musculocutaneous nerve)
Cephalic vein
Extensor retinaculum
Superficial branch of radial nerve
Dorsal venous network
Dorsal digital nerves and veins

Note: In 70% of cases, a median cubital vein (tributary to basilic vein) replaces median cephalic and median basilic veins (see Plate 401).

Lymph Vessels and Nodes of Upper Limb

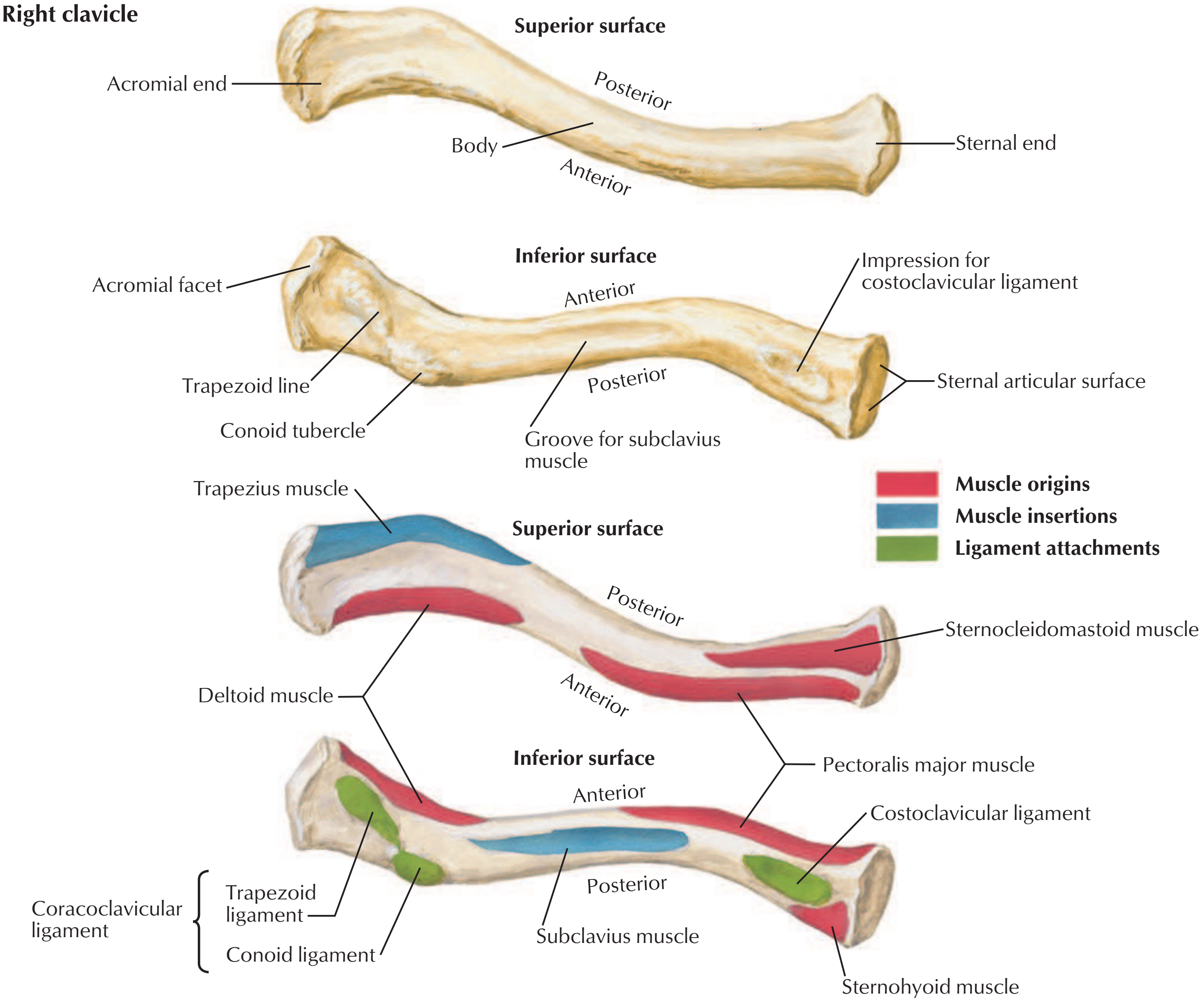
See also **Plates 191**, **458**

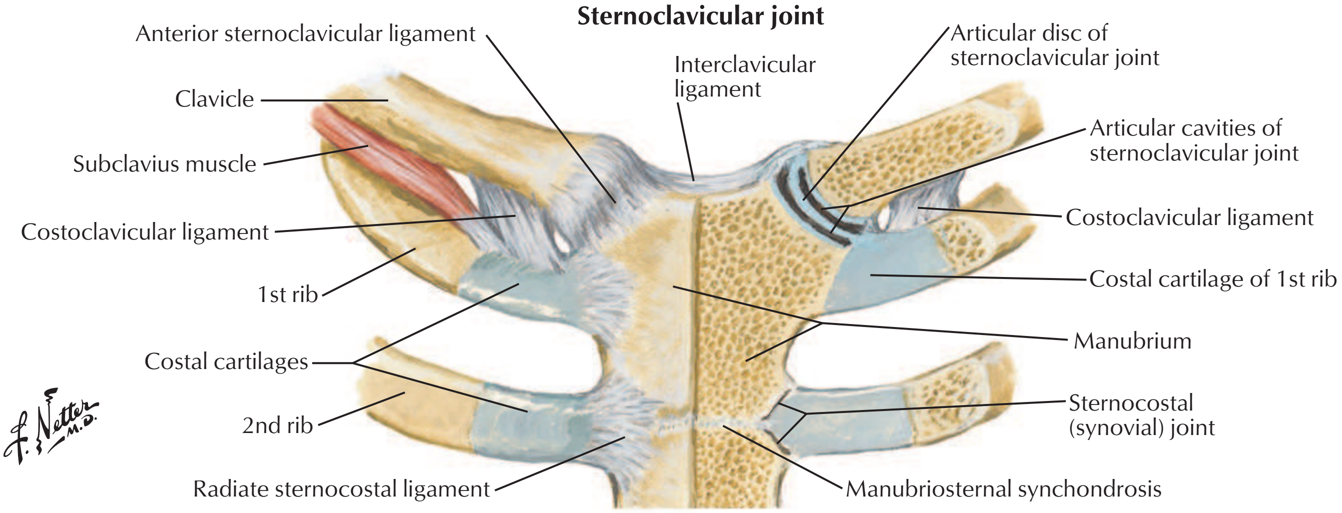

Intraclavicular node
Lateral axillary (humeral) nodes (along axillary vein)
Cephalic vein
Basilic vein
Supratrochlear nodes
Median cubital vein
Cephalic vein
Basilic vein
Vessels passing to dorsum of hand
Vessels passing to dorsum of hand
Vessels passing around interdigital space to dorsum of hand
Vessels passing to dorsum of fingers

Note: Arrows indicate direction of drainage.

Clavicle and Sternoclavicular Joint

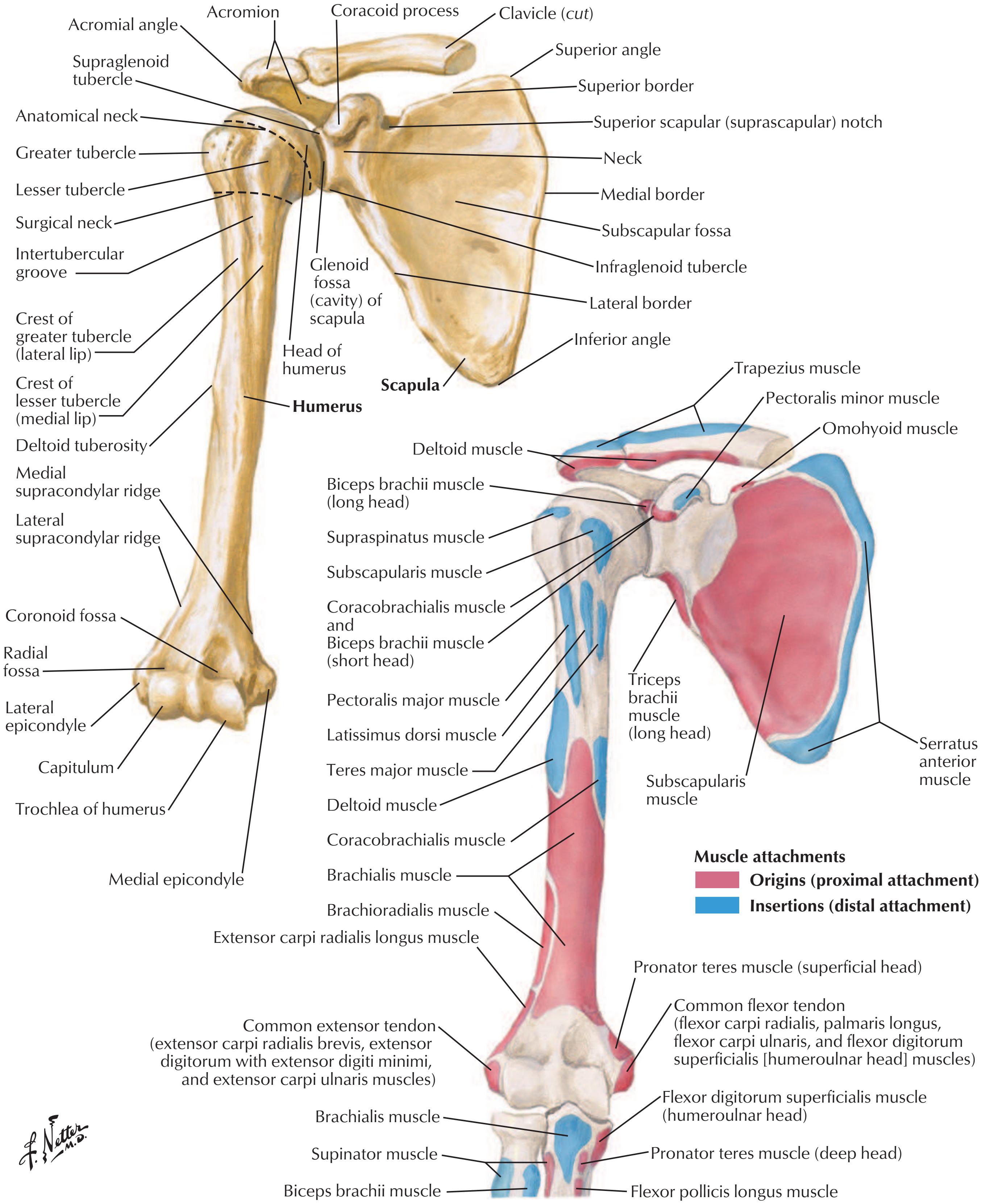
See also Plates 192, 195


Right clavicle
Superior surface
Acromial end
Posterior
Body
Anterior
Sternal end
Inferior surface
Acromial facet
Anterior
Impression for costoclavicular ligament
Trapezoid line
Posterior
Sternal articular surface
Conoid tubercle
Groove for subclavius muscle
🟥 Muscle origins
🟦 Muscle insertions
🟩 Ligament attachments
Trapezius muscle
Superior surface
Posterior
Sternocleidomastoid muscle
Deltoid muscle
Anterior
Inferior surface
Pectoralis major muscle
Anterior
Costoclavicular ligament
Coracoclavicular ligament
Trapezoid ligament
Conoid ligament
Posterior
Subclavius muscle
Sternohyoid muscle


Sternoclavicular joint
Anterior sternoclavicular ligament
Interclavicular ligament
Articular disc of sternoclavicular joint
Clavicle
Articular cavities of sternoclavicular joint
Subclavius muscle
Costoclavicular ligament
Costoclavicular ligament
1st rib
Costal cartilage of 1st rib
Manubrium
Costal cartilages
Sternocostal (synovial) joint
2nd rib
Radiate sternocostal ligament
Manubriosternal synchondrosis

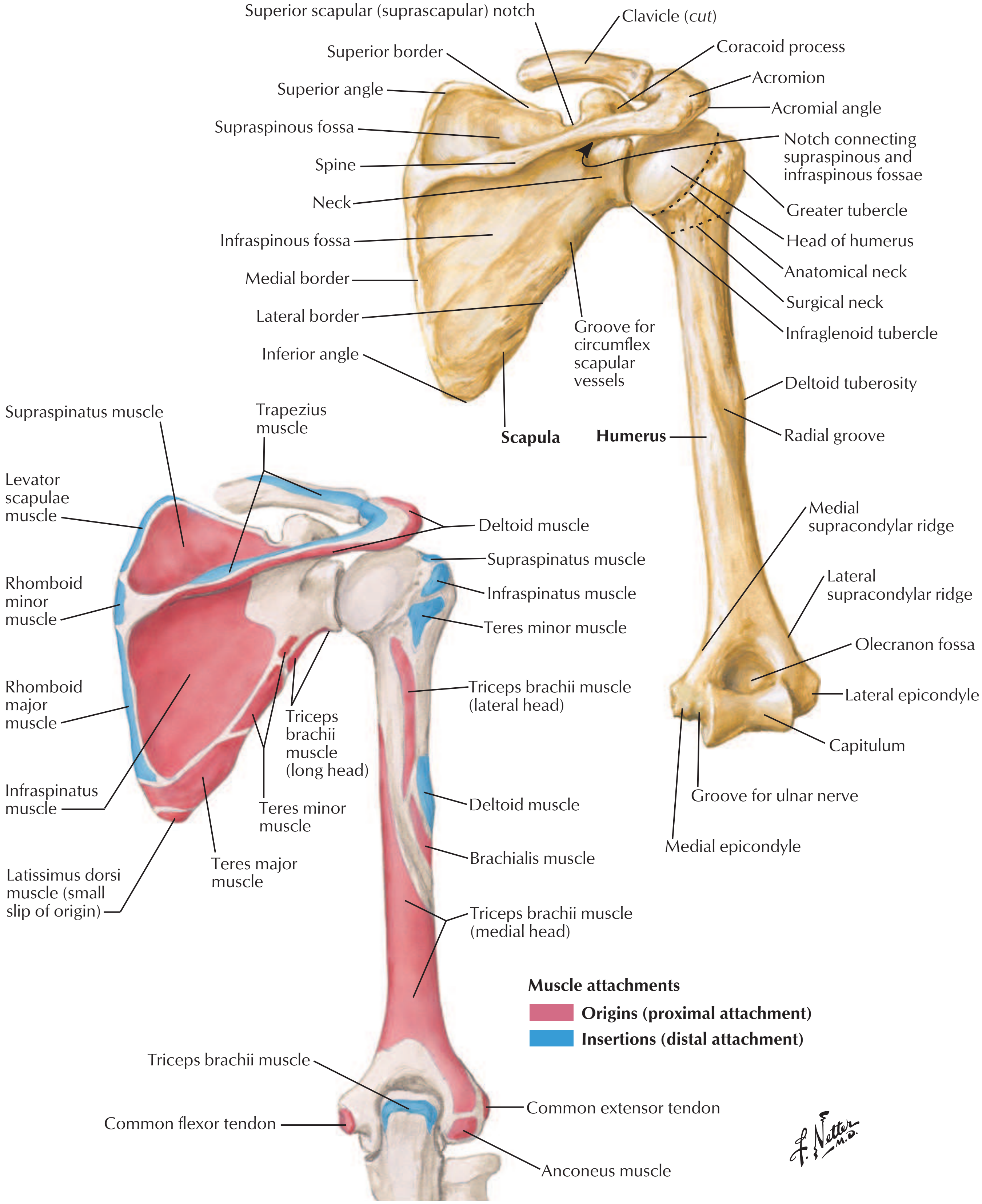
Humerus and Scapula: Anterior Views

See also Plates 192, 411


Acromial angle
Acromion
Coracoid process
Clavicle (*cut*)
Supraglenoid tubercle
Superior angle
Superior border
Anatomical neck
Superior scapular (suprascapular) notch
Greater tubercle
Neck
Lesser tubercle
Medial border
Surgical neck
Subscapular fossa
Intertubercular groove
Infraglenoid tubercle
Glenoid fossa (cavity) of scapula
Lateral border
Crest of greater tubercle (lateral lip)
Inferior angle
Head of humerus
Crest of lesser tubercle (medial lip)
Scapula
Humerus
Deltoid tuberosity
Medial supracondylar ridge
Lateral supracondylar ridge
Coronoid fossa
Radial fossa
Lateral epicondyle
Capitulum
Trochlea of humerus
Medial epicondyle
Trapezius muscle
Pectoralis minor muscle
Omohyoid muscle
Deltoid muscle
Biceps brachii muscle (long head)
Supraspinatus muscle
Subscapularis muscle
Coracobrachialis muscle and Biceps brachii muscle (short head)
Pectoralis major muscle
Latissimus dorsi muscle
Teres major muscle
Deltoid muscle
Coracobrachialis muscle
Brachialis muscle
Brachioradialis muscle
Extensor carpi radialis longus muscle
Triceps brachii muscle (long head)
Subscapularis muscle
Serratus anterior muscle
Muscle attachments
🟥 **Origins (proximal attachment)**
🟦 **Insertions (distal attachment)**
Pronator teres muscle (superficial head)
Common flexor tendon (flexor carpi radialis, palmaris longus, flexor carpi ulnaris, and flexor digitorum superficialis [humeroulnar head] muscles)
Common extensor tendon (extensor carpi radialis brevis, extensor digitorum with extensor digiti minimi, and extensor carpi ulnaris muscles)
Flexor digitorum superficialis muscle (humeroulnar head)
Brachialis muscle
Supinator muscle
Pronator teres muscle (deep head)
Biceps brachii muscle
Flexor pollicis longus muscle

Humerus and Scapula: Posterior Views

See also Plate 192


Superior scapular (suprascapular) notch
Clavicle (*cut*)
Superior border
Coracoid process
Acromion
Superior angle
Acromial angle
Supraspinous fossa
Notch connecting supraspinous and infraspinous fossae
Spine
Greater tubercle
Neck
Head of humerus
Infraspinous fossa
Anatomical neck
Medial border
Surgical neck
Lateral border
Infraglenoid tubercle
Groove for circumflex scapular vessels
Inferior angle
Deltoid tuberosity
Scapula
Humerus
Radial groove
Supraspinatus muscle
Trapezius muscle
Levator scapulae muscle
Deltoid muscle
Medial supracondylar ridge
Supraspinatus muscle
Infraspinatus muscle
Lateral supracondylar ridge
Rhomboid minor muscle
Teres minor muscle
Olecranon fossa
Triceps brachii muscle (lateral head)
Lateral epicondyle
Rhomboid major muscle
Triceps brachii muscle (long head)
Capitulum
Groove for ulnar nerve
Infraspinatus muscle
Teres minor muscle
Deltoid muscle
Medial epicondyle
Latissimus dorsi muscle (small slip of origin)
Teres major muscle
Brachialis muscle
Triceps brachii muscle (medial head)
Triceps brachii muscle
Common extensor tendon
Common flexor tendon
Anconeus muscle

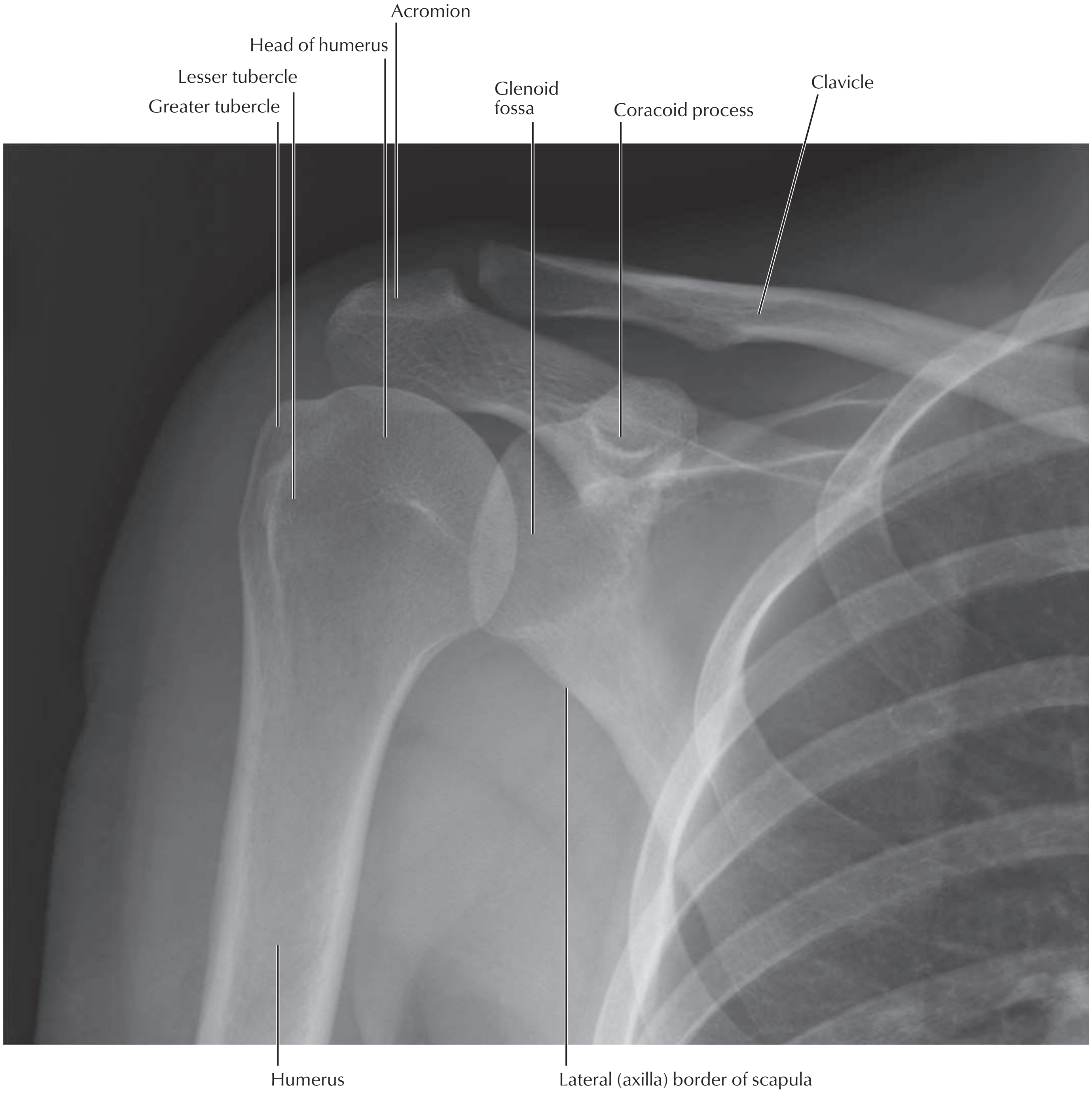
Muscle attachments

- 🟥 **Origins (proximal attachment)**
- 🟦 **Insertions (distal attachment)**

F. Netter M.D.

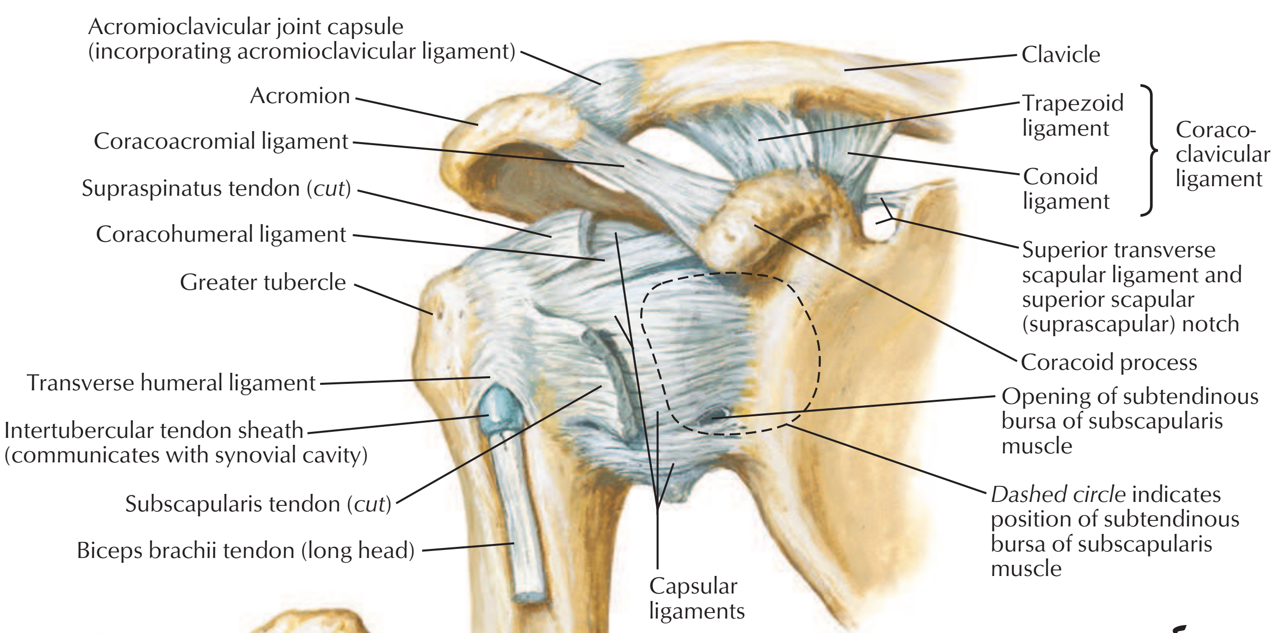
See also **Plate 409**

Anteroposterior Radiograph of Shoulder

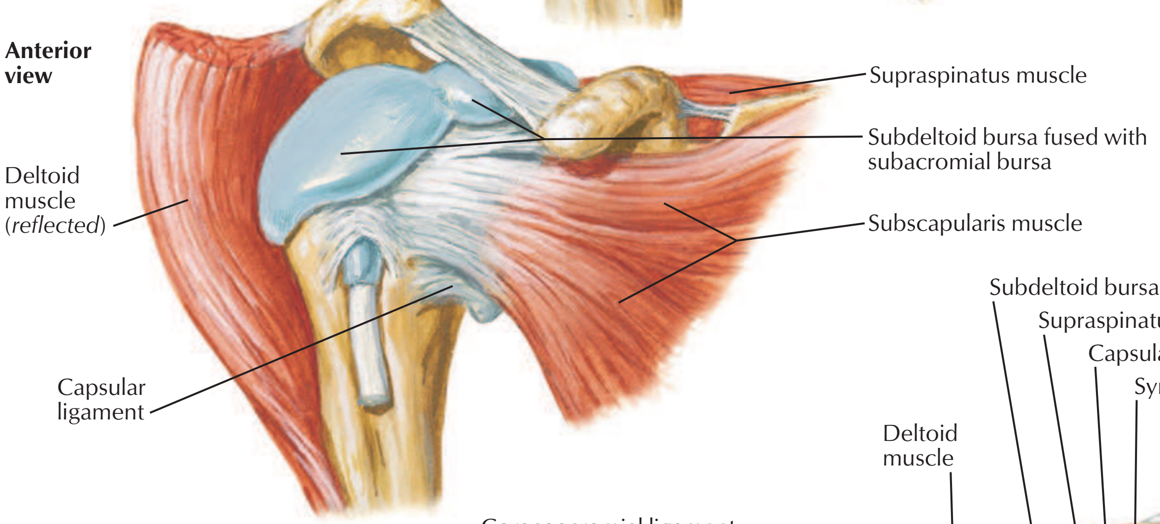

Acromion
Head of humerus
Lesser tubercle
Greater tubercle
Glenoid fossa
Coracoid process
Clavicle
Humerus
Lateral (axilla) border of scapula

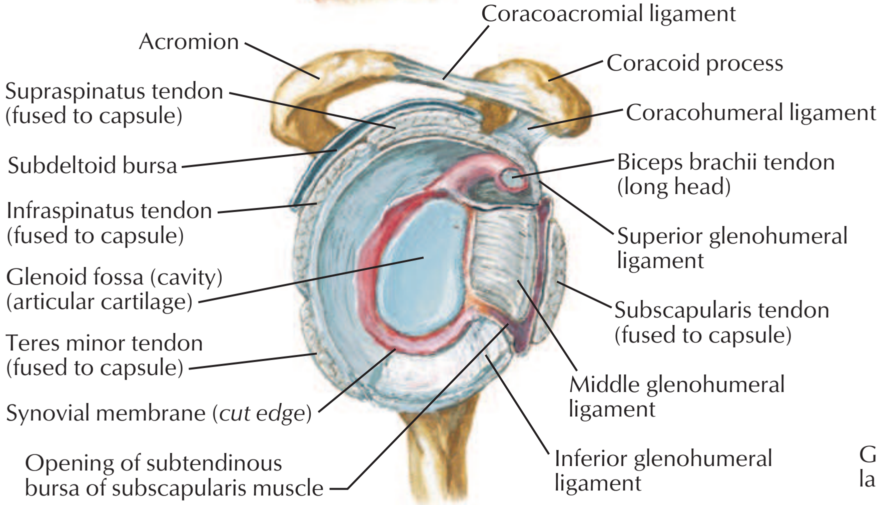
See also Plate 415

Anterior view

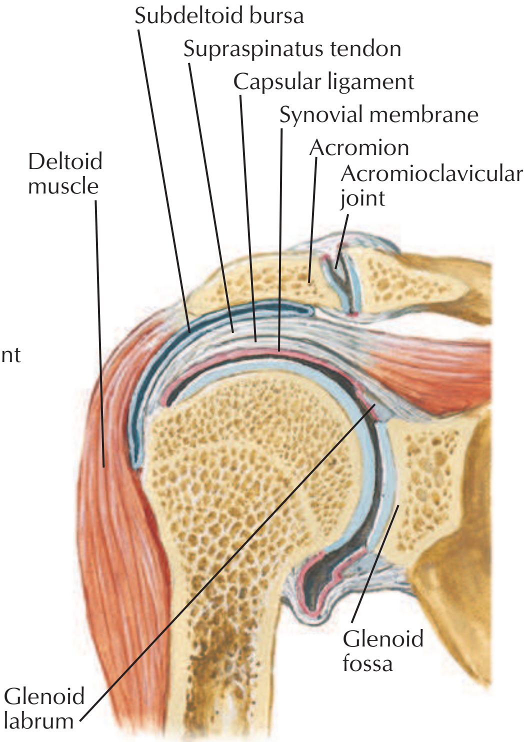

Acromioclavicular joint capsule (incorporating acromioclavicular ligament)
Acromion
Coracoacromial ligament
Supraspinatus tendon (*cut*)
Coracohumeral ligament
Greater tubercle
Transverse humeral ligament
Intertubercular tendon sheath (communicates with synovial cavity)
Subscapularis tendon (*cut*)
Biceps brachii tendon (long head)
Capsular ligaments
Clavicle
Trapezoid ligament
Conoid ligament
Coraco-clavicular ligament
Superior transverse scapular ligament and superior scapular (suprascapular) notch
Coracoid process
Opening of subtendinous bursa of subscapularis muscle
Dashed circle indicates position of subtendinous bursa of subscapularis muscle
F. Netter M.D.

Anterior view


Deltoid muscle (*reflected*)
Capsular ligament
Supraspinatus muscle
Subdeltoid bursa fused with subacromial bursa
Subscapularis muscle


Acromion
Supraspinatus tendon (fused to capsule)
Subdeltoid bursa
Infraspinatus tendon (fused to capsule)
Glenoid fossa (cavity) (articular cartilage)
Teres minor tendon (fused to capsule)
Synovial membrane (*cut edge*)
Opening of subtendinous bursa of subscapularis muscle
Coracoacromial ligament
Coracoid process
Coracohumeral ligament
Biceps brachii tendon (long head)
Superior glenohumeral ligament
Subscapularis tendon (fused to capsule)
Middle glenohumeral ligament
Inferior glenohumeral ligament

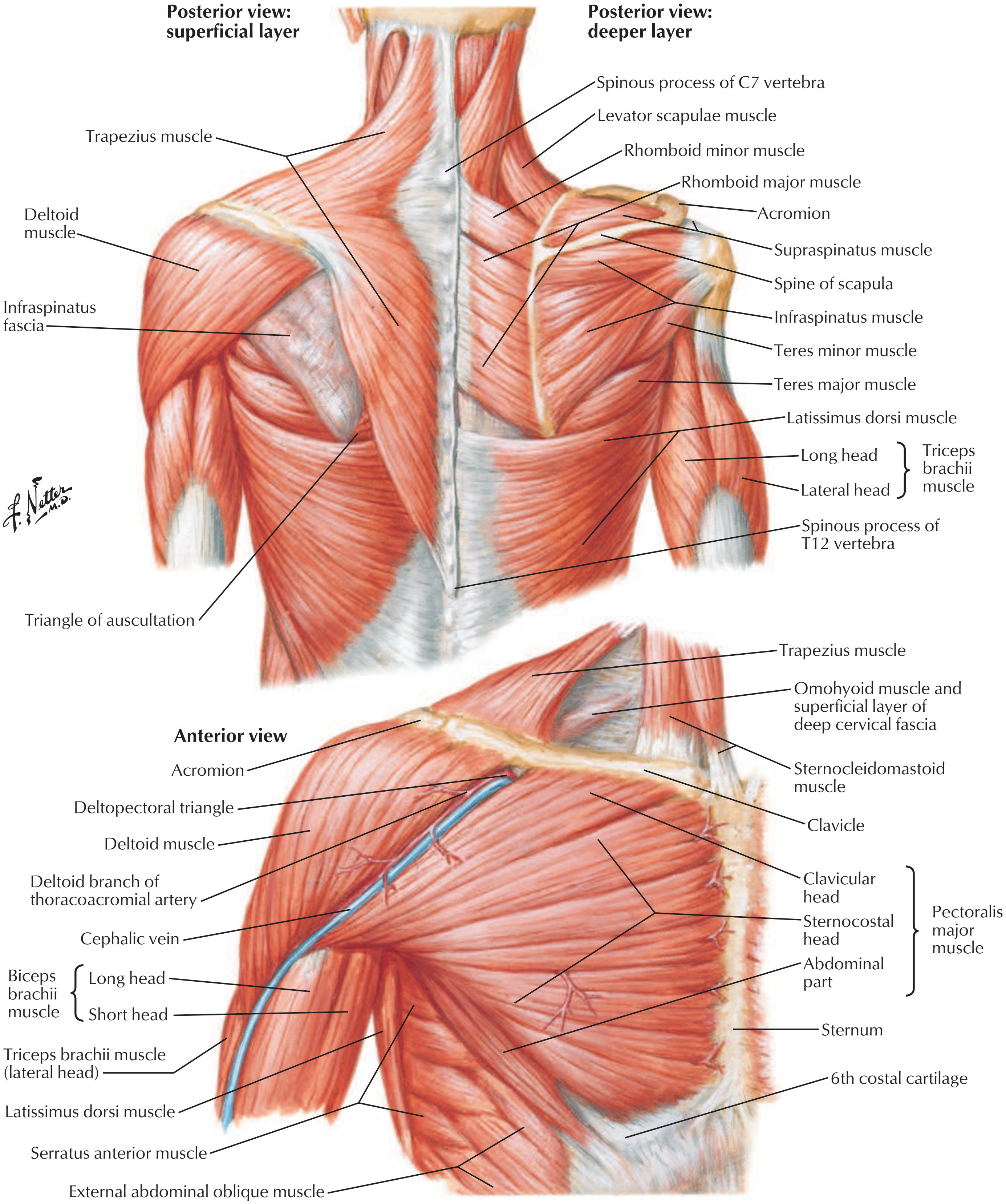
Joint opened: lateral view


Subdeltoid bursa
Supraspinatus tendon
Capsular ligament
Synovial membrane
Acromion
Acromioclavicular joint
Deltoid muscle
Glenoid fossa
Glenoid labrum

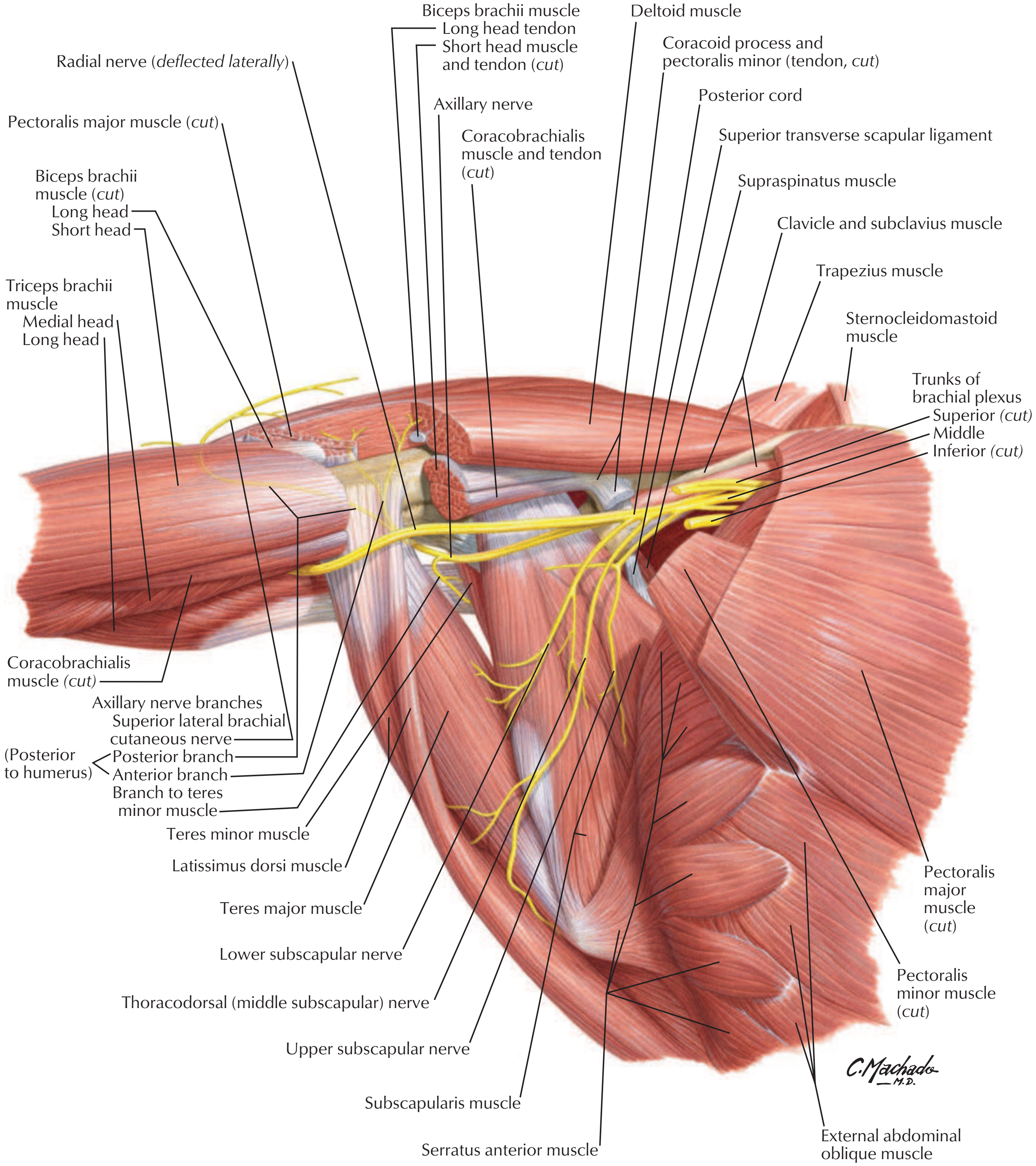
Coronal section through shoulder girdle

Muscles of Shoulder

See also Plates 180, 194



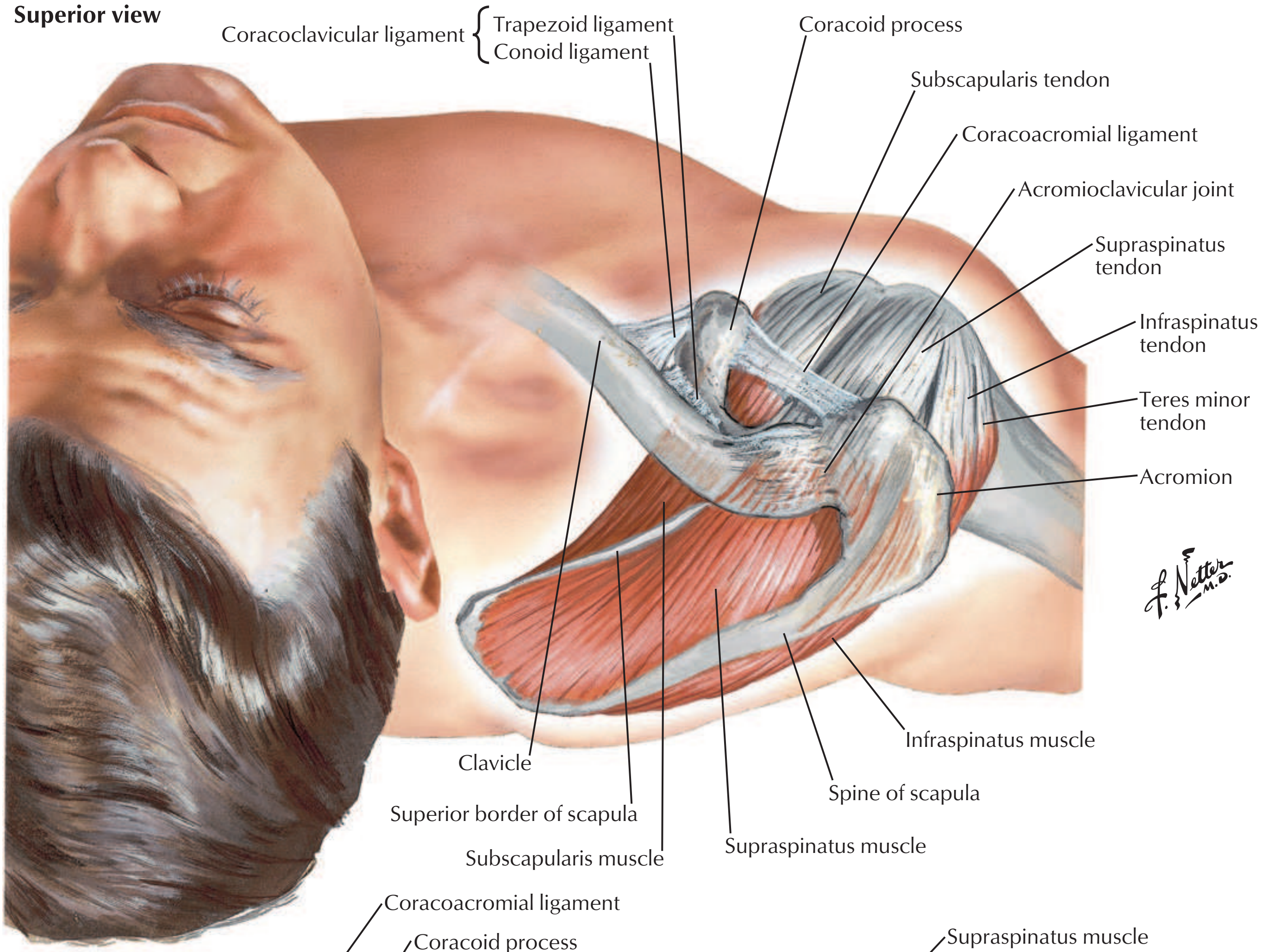
Posterior view: superficial layer
Posterior view: deeper layer
Spinous process of C7 vertebra
Levator scapulae muscle
Trapezius muscle
Rhomboid minor muscle
Rhomboid major muscle
Acromion
Deltoid muscle
Supraspinatus muscle
Spine of scapula
Infraspinatus fascia
Infraspinatus muscle
Teres minor muscle
Teres major muscle
Latissimus dorsi muscle
Long head
Lateral head
Triceps brachii muscle
Spinous process of T12 vertebra
Triangle of auscultation
Trapezius muscle
Omohyoid muscle and superficial layer of deep cervical fascia
Anterior view
Acromion
Sternocleidomastoid muscle
Deltopectoral triangle
Deltoid muscle
Clavicle
Deltoid branch of thoracoacromial artery
Clavicular head
Sternocostal head
Abdominal part
Pectoralis major muscle
Cephalic vein
Biceps brachii muscle
Long head
Short head
Sternum
Triceps brachii muscle (lateral head)
6th costal cartilage
Latissimus dorsi muscle
Serratus anterior muscle
External abdominal oblique muscle

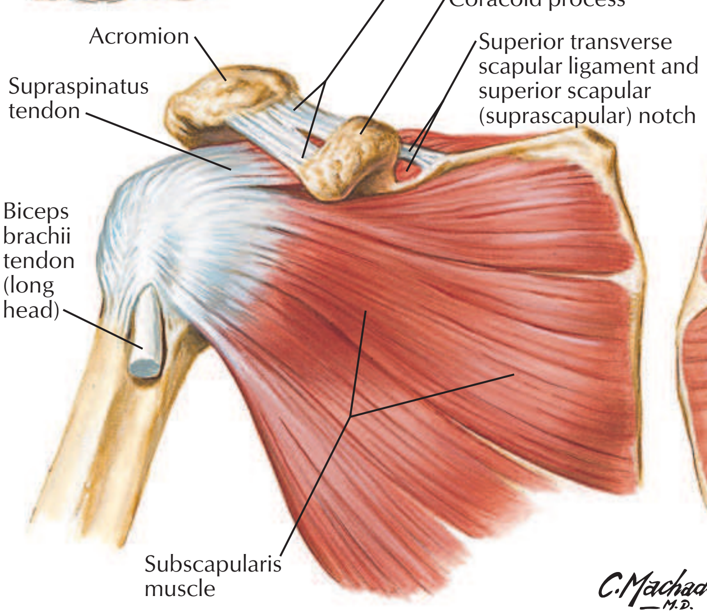

Biceps brachii muscle
Long head tendon
Short head muscle and tendon (*cut*)
Deltoid muscle
Radial nerve (*deflected laterally*)
Coracoid process and pectoralis minor (tendon, *cut*)
Axillary nerve
Posterior cord
Pectoralis major muscle (*cut*)
Coracobrachialis muscle and tendon (*cut*)
Superior transverse scapular ligament
Biceps brachii muscle (*cut*)
Long head
Short head
Supraspinatus muscle
Clavicle and subclavius muscle
Trapezius muscle
Triceps brachii muscle
Medial head
Long head
Sternocleidomastoid muscle
Trunks of brachial plexus
Superior (*cut*)
Middle
Inferior (*cut*)
Coracobrachialis muscle (*cut*)
Axillary nerve branches
Superior lateral brachial cutaneous nerve
(Posterior to humerus)
Posterior branch
Anterior branch
Branch to teres minor muscle
Teres minor muscle
Latissimus dorsi muscle
Pectoralis major muscle (*cut*)
Teres major muscle
Lower subscapular nerve
Pectoralis minor muscle (*cut*)
Thoracodorsal (middle subscapular) nerve
Upper subscapular nerve
C.Machado M.D.
Subscapularis muscle
Serratus anterior muscle
External abdominal oblique muscle

Muscles of Rotator (Compressor) Cuff

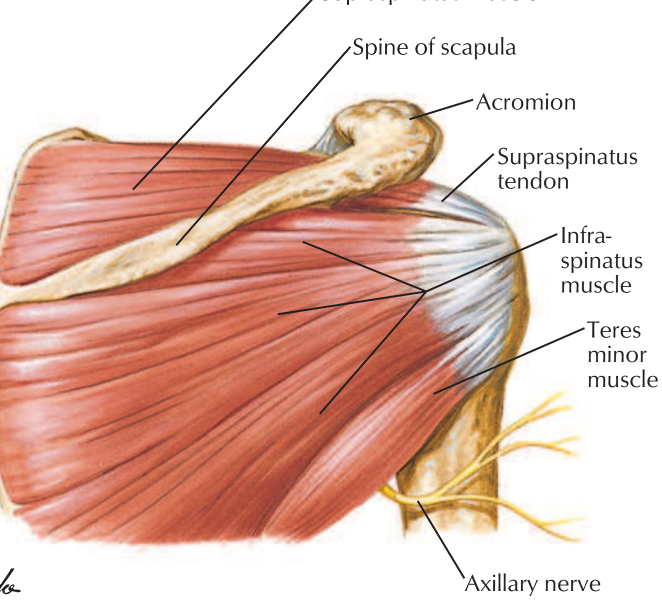
See also Plates 412, 421, 422

Superior view


Coracoclavicular ligament
Trapezoid ligament
Conoid ligament
Coracoid process
Subscapularis tendon
Coracoacromial ligament
Acromioclavicular joint
Supraspinatus tendon
Infraspinatus tendon
Teres minor tendon
Acromion
Infraspinatus muscle
Clavicle
Spine of scapula
Superior border of scapula
Supraspinatus muscle
Subscapularis muscle


Coracoacromial ligament
Coracoid process
Acromion
Superior transverse scapular ligament and superior scapular (suprascapular) notch
Supraspinatus tendon
Biceps brachii tendon (long head)
Subscapularis muscle

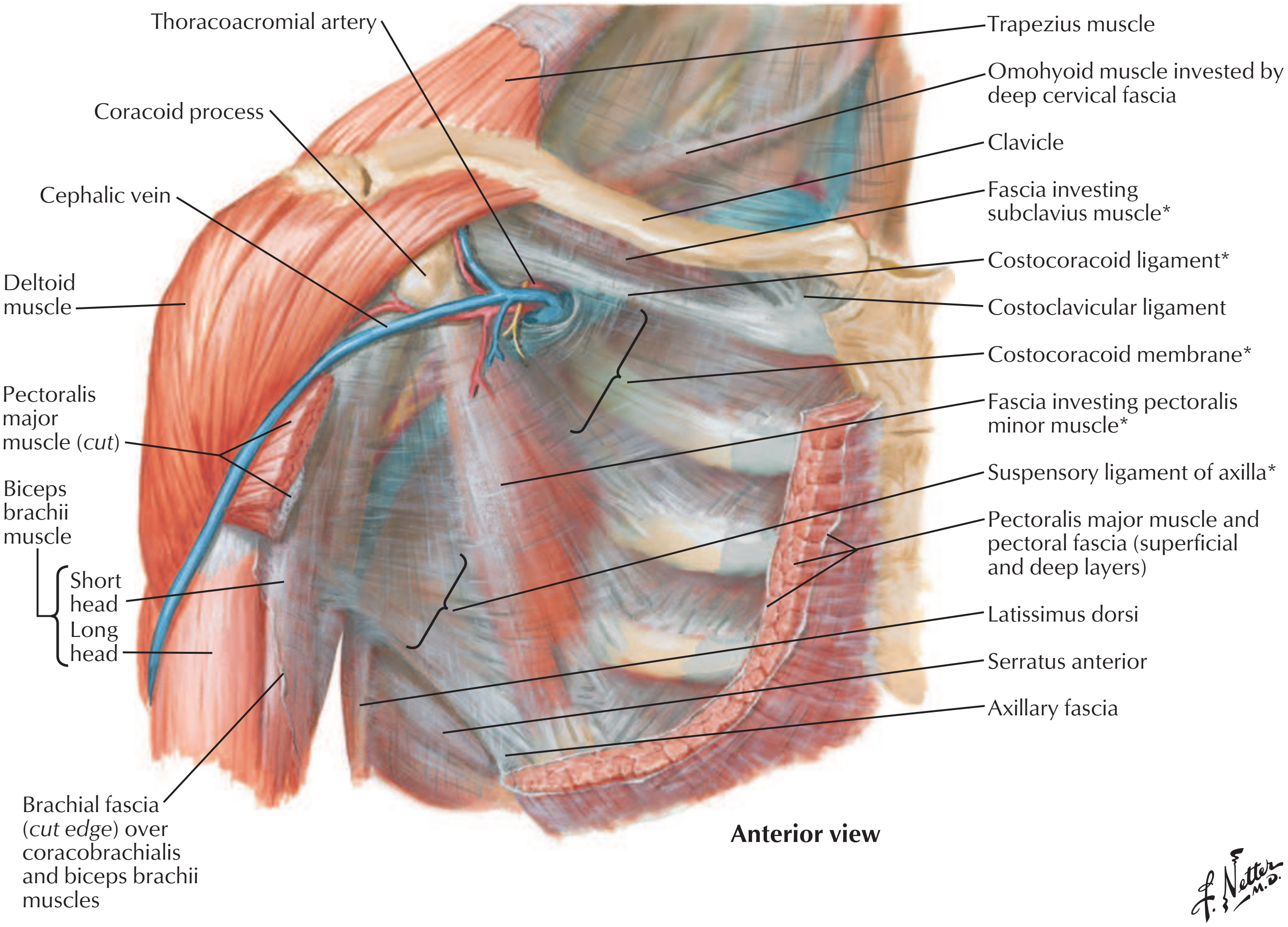
Anterior view


Supraspinatus muscle
Spine of scapula
Acromion
Supraspinatus tendon
Infra-spinatus muscle
Teres minor muscle
Axillary nerve

Posterior view

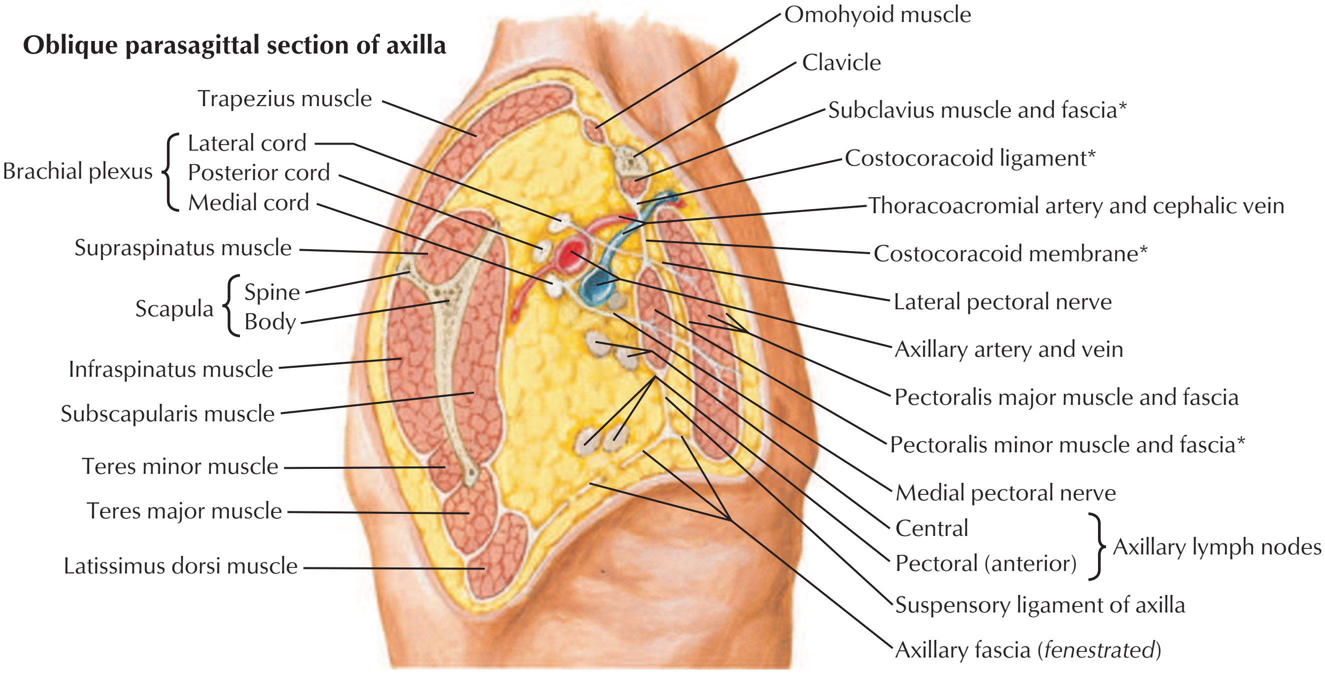
Pectoral, Clavipectoral, and Axillary Fasciae

See also Plates 190, 194


Thoracoacromial artery
Coracoid process
Cephalic vein
Deltoid muscle
Pectoralis major muscle (*cut*)
Biceps brachii muscle
Short head
Long head
Brachial fascia (*cut edge*) over coracobrachialis and biceps brachii muscles
Trapezius muscle
Omohyoid muscle invested by deep cervical fascia
Clavicle
Fascia investing subclavius muscle*
Costocoracoid ligament*
Costoclavicular ligament
Costocoracoid membrane*
Fascia investing pectoralis minor muscle*
Suspensory ligament of axilla*
Pectoralis major muscle and pectoral fascia (superficial and deep layers)
Latissimus dorsi
Serratus anterior
Axillary fascia
F. Netter M.D.

Anterior view

Oblique parasagittal section of axilla

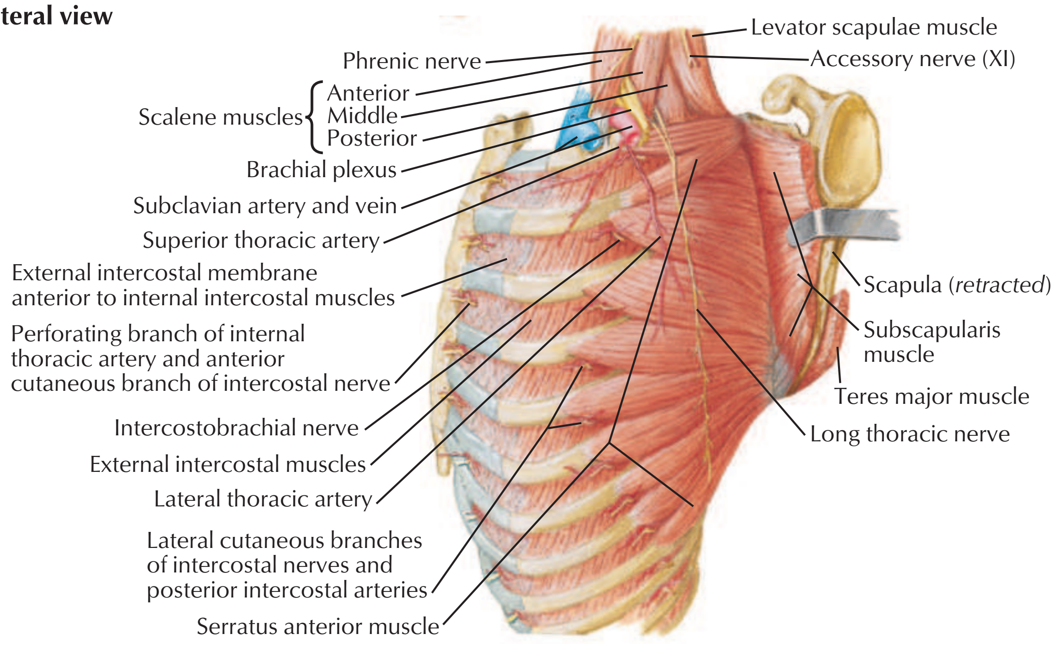

Trapezius muscle
Brachial plexus
Lateral cord
Posterior cord
Medial cord
Supraspinatus muscle
Scapula
Spine
Body
Infraspinatus muscle
Subscapularis muscle
Teres minor muscle
Teres major muscle
Latissimus dorsi muscle
Omohyoid muscle
Clavicle
Subclavius muscle and fascia*
Costocoracoid ligament*
Thoracoacromial artery and cephalic vein
Costocoracoid membrane*
Lateral pectoral nerve
Axillary artery and vein
Pectoralis major muscle and fascia
Pectoralis minor muscle and fascia*
Medial pectoral nerve
Central
Pectoral (anterior)
Axillary lymph nodes
Suspensory ligament of axilla
Axillary fascia (*fenestrated*)

*Components of clavipectoral fascia

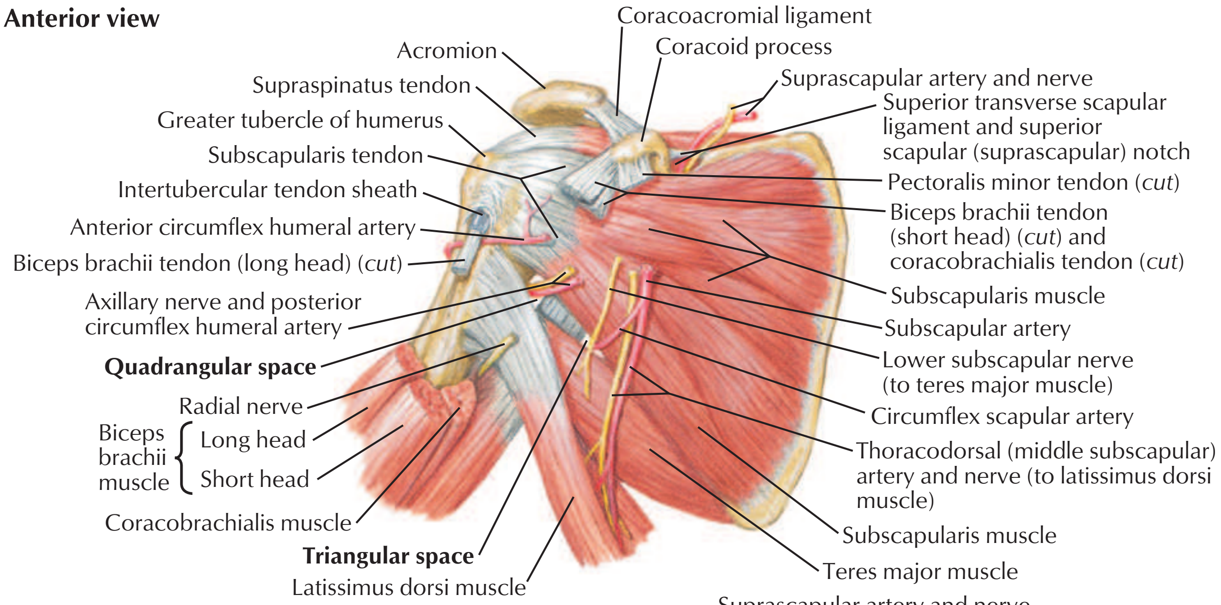
Scapulothoracic and Shoulder Dissection

See also Plates 419, 468

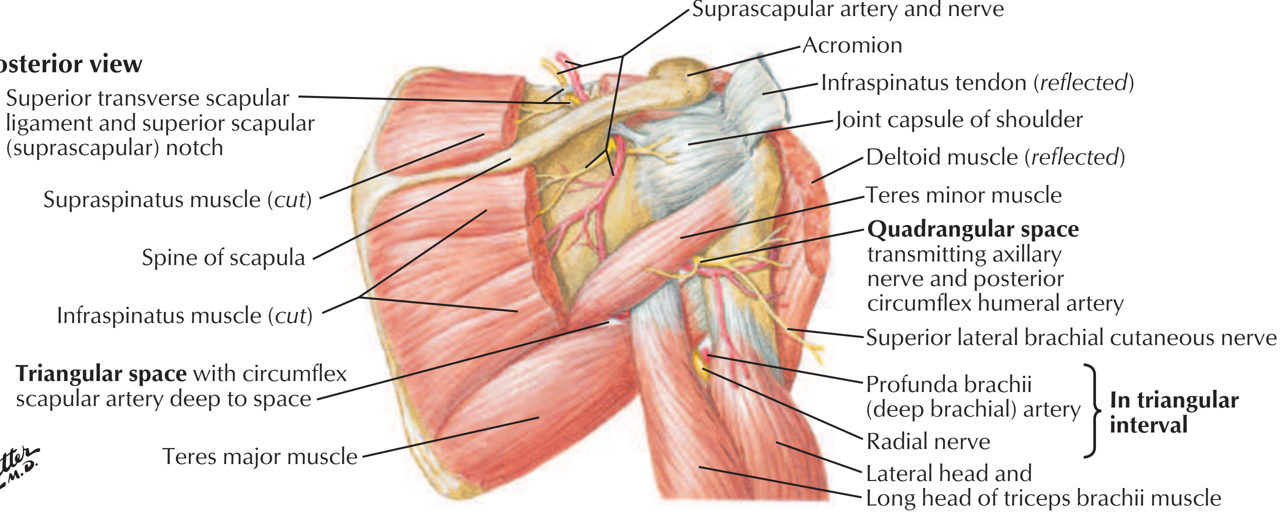
Lateral view


Levator scapulae muscle
Accessory nerve (XI)
Phrenic nerve
Scalene muscles
Anterior
Middle
Posterior
Brachial plexus
Subclavian artery and vein
Superior thoracic artery
External intercostal membrane anterior to internal intercostal muscles
Perforating branch of internal thoracic artery and anterior cutaneous branch of intercostal nerve
Intercostobrachial nerve
External intercostal muscles
Lateral thoracic artery
Lateral cutaneous branches of intercostal nerves and posterior intercostal arteries
Serratus anterior muscle
Scapula (retracted)
Subscapularis muscle
Teres major muscle
Long thoracic nerve

Anterior view


Coracoacromial ligament
Coracoid process
Acromion
Supraspinatus tendon
Greater tubercle of humerus
Subscapularis tendon
Intertubercular tendon sheath
Anterior circumflex humeral artery
Biceps brachii tendon (long head) (cut)
Axillary nerve and posterior circumflex humeral artery
Quadrangular space
Radial nerve
Biceps brachii muscle
Long head
Short head
Coracobrachialis muscle
Triangular space
Latissimus dorsi muscle
Suprascapular artery and nerve
Superior transverse scapular ligament and superior scapular (suprascapular) notch
Pectoralis minor tendon (cut)
Biceps brachii tendon (short head) (cut) and coracobrachialis tendon (cut)
Subscapularis muscle
Subscapular artery
Lower subscapular nerve (to teres major muscle)
Circumflex scapular artery
Thoracodorsal (middle subscapular) artery and nerve (to latissimus dorsi muscle)
Subscapularis muscle
Teres major muscle

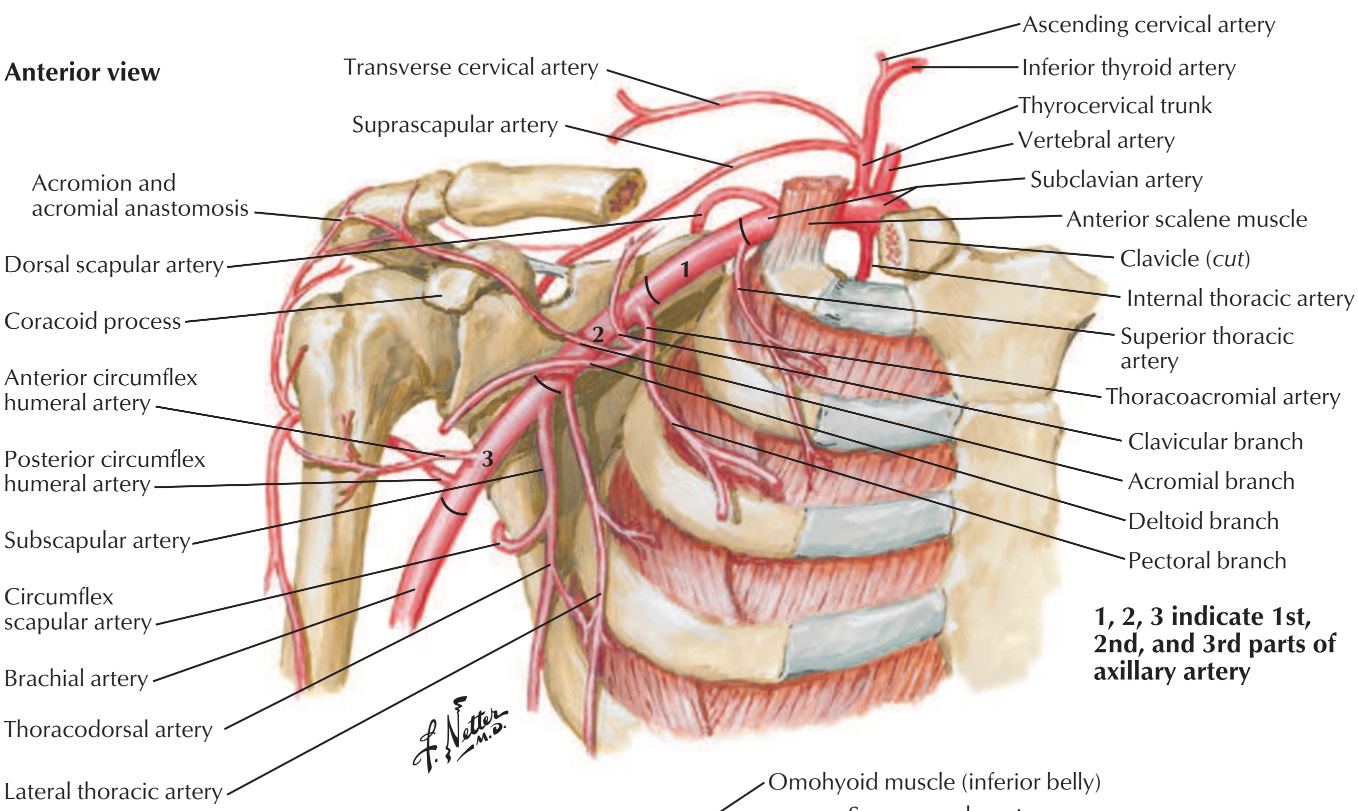
Posterior view


Suprascapular artery and nerve
Acromion
Infraspinatus tendon (reflected)
Joint capsule of shoulder
Deltoid muscle (reflected)
Teres minor muscle
Quadrangular space transmitting axillary nerve and posterior circumflex humeral artery
Superior lateral brachial cutaneous nerve
Profunda brachii (deep brachial) artery
Radial nerve
In triangular interval
Lateral head and
Long head of triceps brachii muscle
Superior transverse scapular ligament and superior scapular (suprascapular) notch
Supraspinatus muscle (cut)
Spine of scapula
Infraspinatus muscle (cut)
Triangular space with circumflex scapular artery deep to space
Teres major muscle

Axillary Artery and Anastomoses Around Scapula

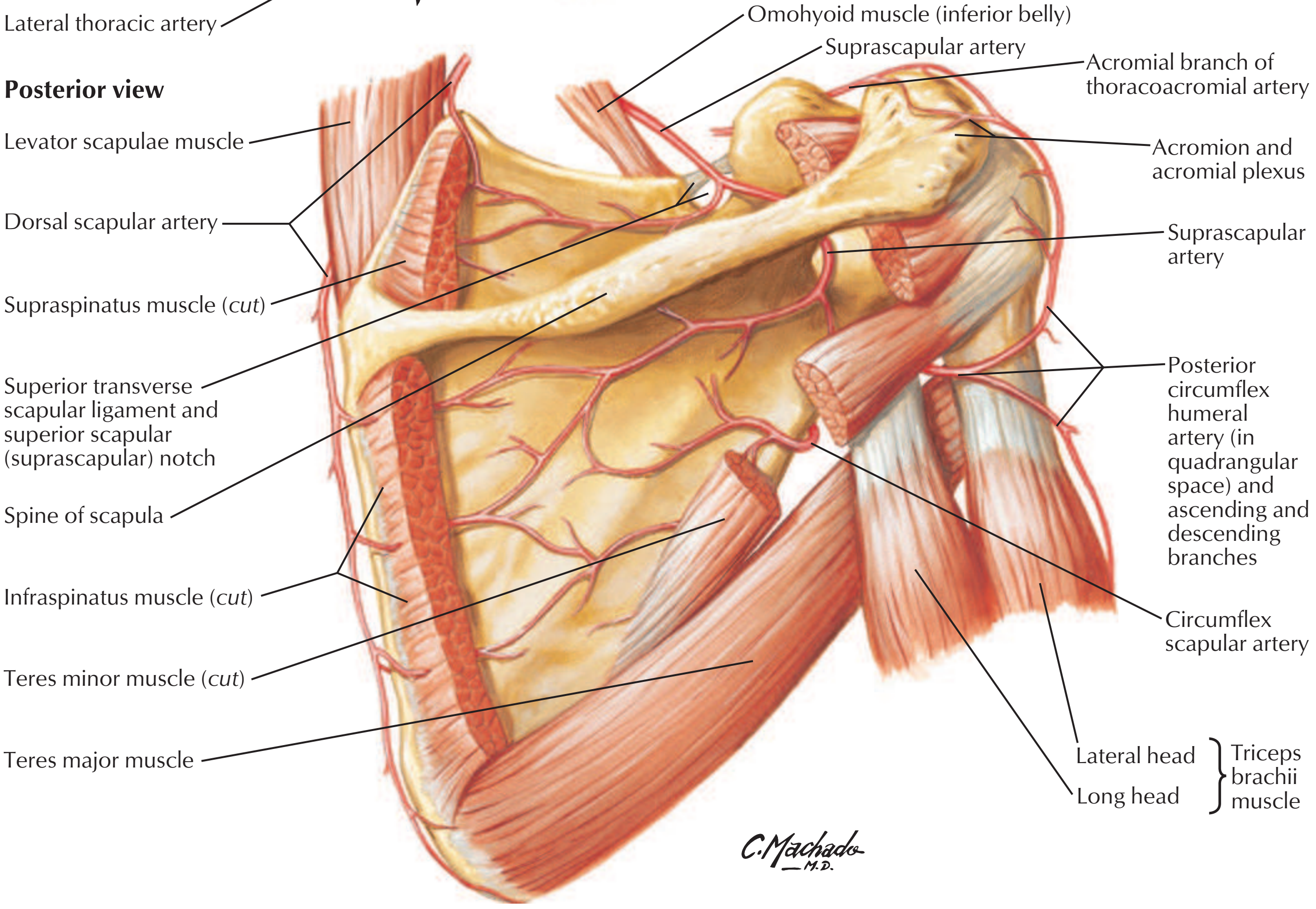
See also Plates 40, 424

Anterior view


Transverse cervical artery
Suprascapular artery
Acromion and acromial anastomosis
Dorsal scapular artery
Coracoid process
Anterior circumflex humeral artery
Posterior circumflex humeral artery
Subscapular artery
Circumflex scapular artery
Brachial artery
Thoracodorsal artery
Lateral thoracic artery
Ascending cervical artery
Inferior thyroid artery
Thyrocervical trunk
Vertebral artery
Subclavian artery
Anterior scalene muscle
Clavicle (cut)
Internal thoracic artery
Superior thoracic artery
Thoracoacromial artery
Clavicular branch
Acromial branch
Deltoid branch
Pectoral branch
1
2
3
F. Netter M.D.

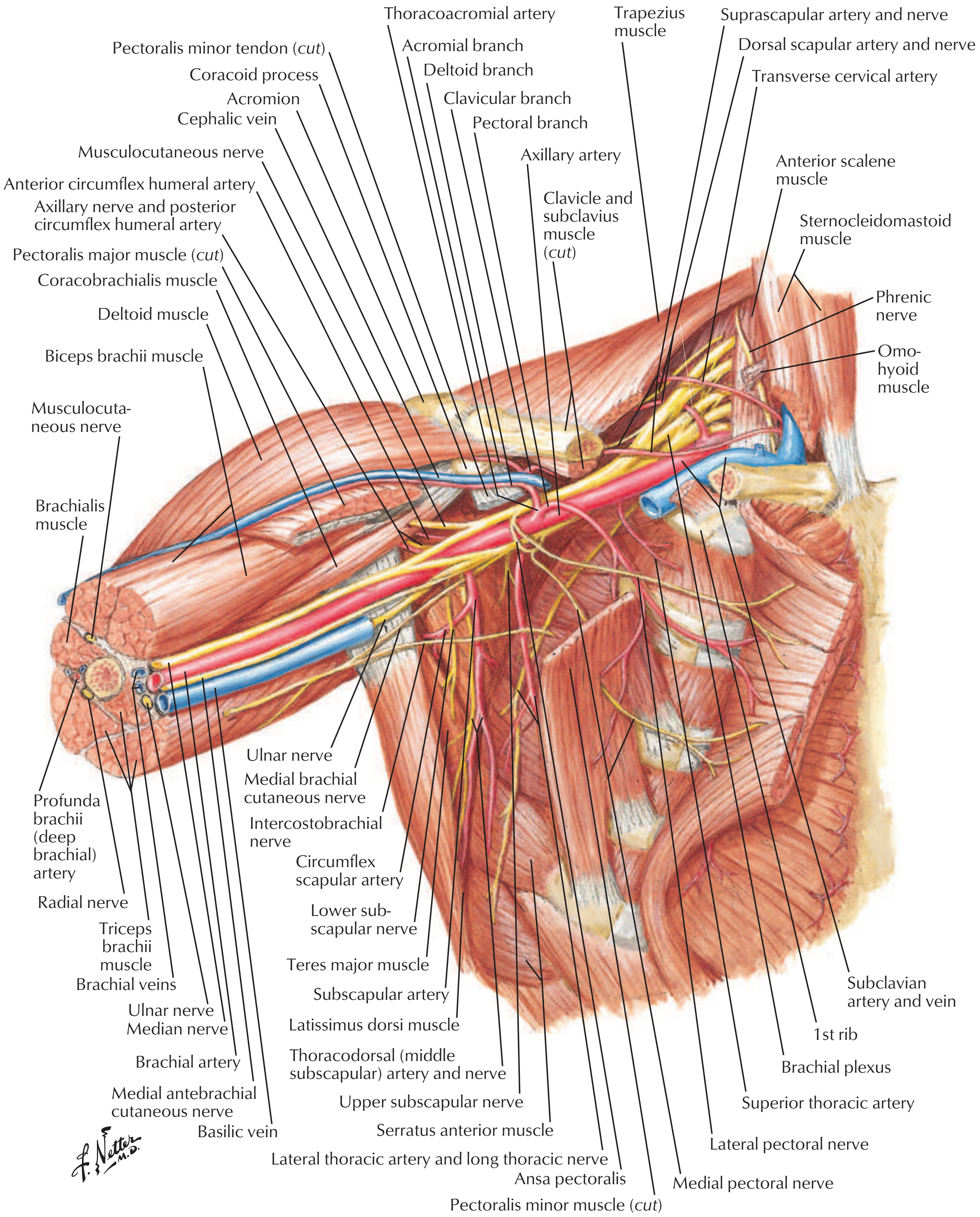
1, 2, 3 indicate 1st, 2nd, and 3rd parts of axillary artery

Posterior view


Levator scapulae muscle
Dorsal scapular artery
Supraspinatus muscle (cut)
Superior transverse scapular ligament and superior scapular (suprascapular) notch
Spine of scapula
Infraspinatus muscle (cut)
Teres minor muscle (cut)
Teres major muscle
Omohyoid muscle (inferior belly)
Suprascapular artery
Acromial branch of thoracoacromial artery
Acromion and acromial plexus
Suprascapular artery
Posterior circumflex humeral artery (in quadrangular space) and ascending and descending branches
Circumflex scapular artery
Lateral head
Long head
Triceps brachii muscle
C.Machado M.D.

Axilla: Anterior View

See also **Plates 414, 417**

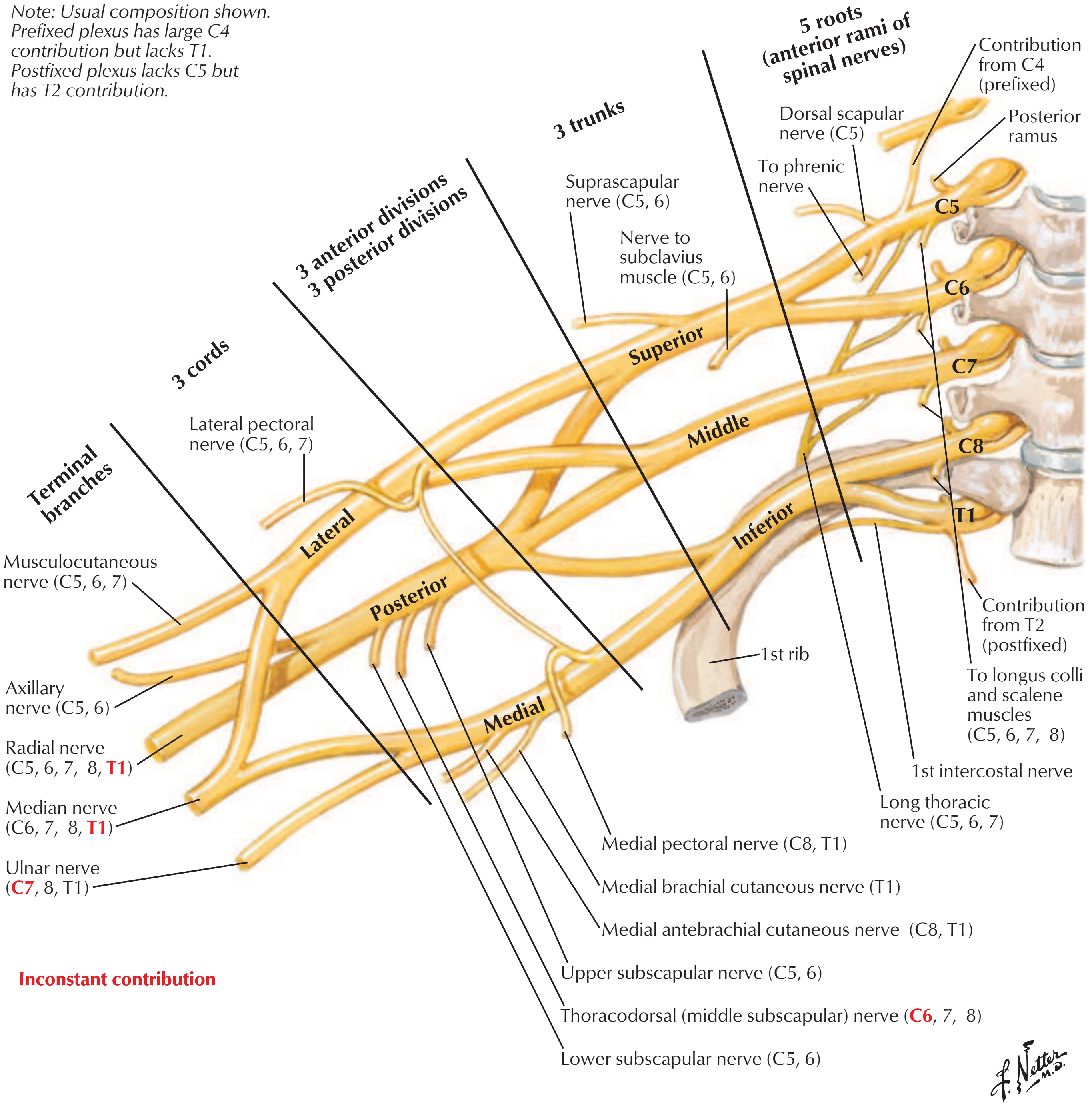


Pectoralis minor tendon (*cut*)
Coracoid process
Acromion
Cephalic vein
Musculocutaneous nerve
Anterior circumflex humeral artery
Axillary nerve and posterior circumflex humeral artery
Pectoralis major muscle (*cut*)
Coracobrachialis muscle
Deltoid muscle
Biceps brachii muscle
Musculocutaneous nerve
Brachialis muscle
Thoracoacromial artery
Acromial branch
Deltoid branch
Clavicular branch
Pectoral branch
Axillary artery
Clavicle and subclavius muscle (*cut*)
Trapezius muscle
Suprascapular artery and nerve
Dorsal scapular artery and nerve
Transverse cervical artery
Anterior scalene muscle
Sternocleidomastoid muscle
Phrenic nerve
Omohyoid muscle
Profunda brachii (deep brachial) artery
Radial nerve
Triceps brachii muscle
Brachial veins
Ulnar nerve
Median nerve
Brachial artery
Medial antebrachial cutaneous nerve
Basilic vein
Ulnar nerve
Medial brachial cutaneous nerve
Intercostobrachial nerve
Circumflex scapular artery
Lower subscapular nerve
Teres major muscle
Subscapular artery
Latissimus dorsi muscle
Thoracodorsal (middle subscapular) artery and nerve
Upper subscapular nerve
Serratus anterior muscle
Lateral thoracic artery and long thoracic nerve
Ansa pectoralis
Pectoralis minor muscle (*cut*)
Medial pectoral nerve
Lateral pectoral nerve
Superior thoracic artery
Brachial plexus
1st rib
Subclavian artery and vein
F. Netter M.D.

Brachial Plexus: Schema

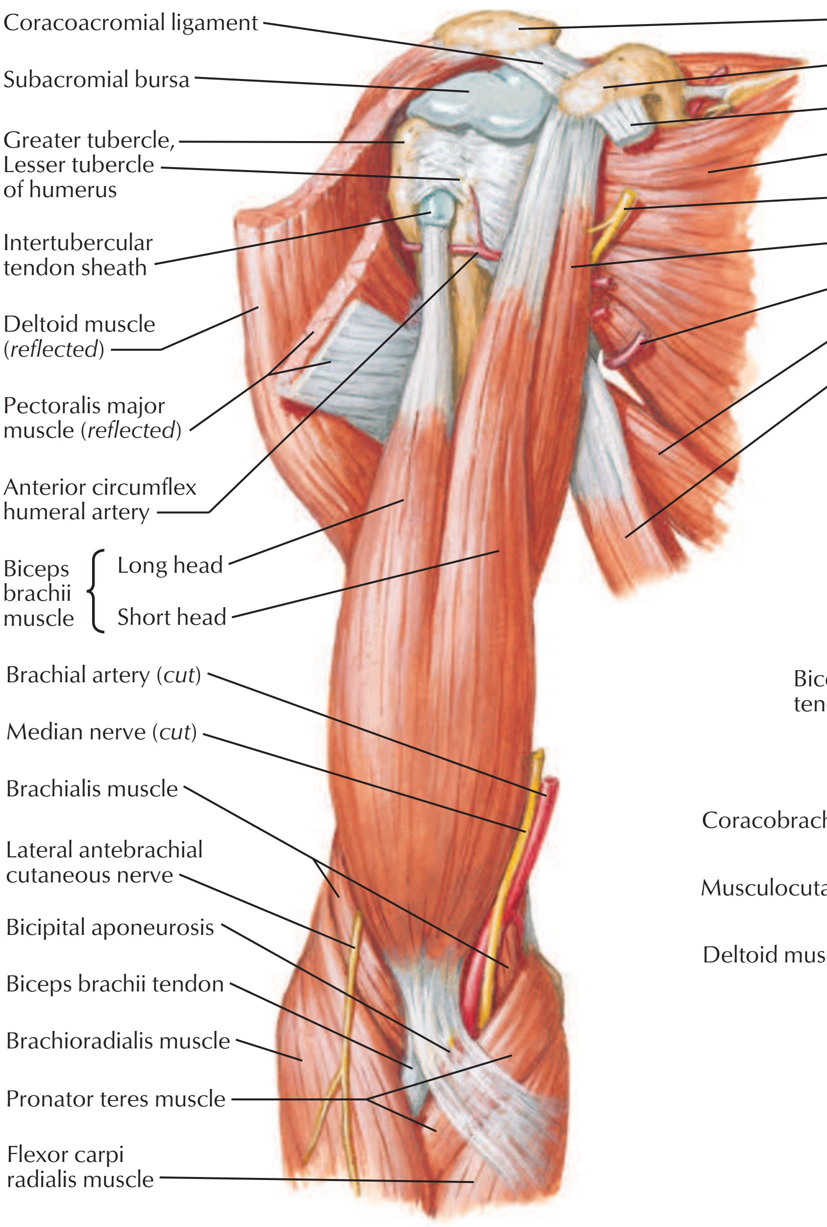
See also Plates 463, 464

Note: Usual composition shown. Prefixed plexus has large C4 contribution but lacks T1. Postfixed plexus lacks C5 but has T2 contribution.


5 roots (anterior rami of spinal nerves)
3 trunks
3 anterior divisions
3 posterior divisions
3 cords
Terminal branches
Contribution from C4 (prefixed)
Posterior ramus
Dorsal scapular nerve (C5)
To phrenic nerve
Suprascapular nerve (C5, 6)
Nerve to subclavius muscle (C5, 6)
C5
C6
C7
C8
T1
Superior
Middle
Inferior
Lateral
Posterior
Medial
Lateral pectoral nerve (C5, 6, 7)
Musculocutaneous nerve (C5, 6, 7)
Axillary nerve (C5, 6)
Radial nerve (C5, 6, 7, 8, **T1**)
Median nerve (C6, 7, 8, **T1**)
Ulnar nerve (**C7**, 8, T1)
1st rib
Contribution from T2 (postfixed)
To longus colli and scalene muscles (C5, 6, 7, 8)
1st intercostal nerve
Long thoracic nerve (C5, 6, 7)
Medial pectoral nerve (C8, T1)
Medial brachial cutaneous nerve (T1)
Medial antebrachial cutaneous nerve (C8, T1)
Upper subscapular nerve (C5, 6)
Thoracodorsal (middle subscapular) nerve (**C6**, 7, 8)
Lower subscapular nerve (C5, 6)
Inconstant contribution
F. Netter M.D.

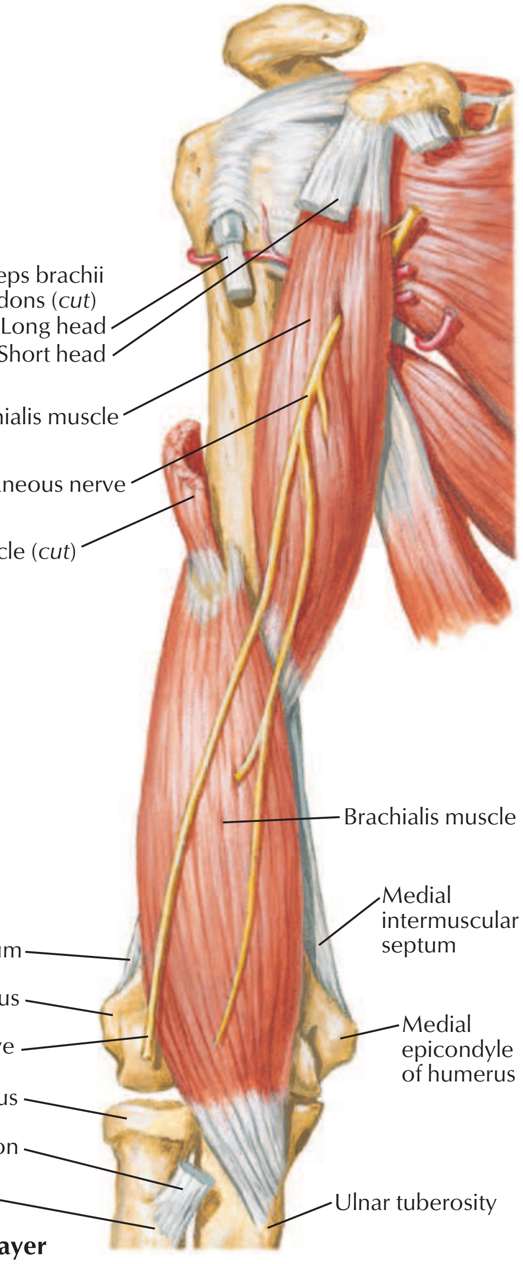
Muscles of Arm: Anterior Views

See also Plates 415, 465



Coracoacromial ligament
Subacromial bursa
Greater tubercle,
Lesser tubercle
of humerus
Intertubercular tendon sheath
Deltoid muscle (*reflected*)
Pectoralis major muscle (*reflected*)
Anterior circumflex humeral artery
Biceps brachii muscle
Long head
Short head
Brachial artery (*cut*)
Median nerve (*cut*)
Brachialis muscle
Lateral antebrachial cutaneous nerve
Bicipital aponeurosis
Biceps brachii tendon
Brachioradialis muscle
Pronator teres muscle
Flexor carpi radialis muscle
Acromion
Coracoid process
Pectoralis minor tendon (*cut*)
Subscapularis muscle
Musculocutaneous nerve (*cut*)
Coracobrachialis muscle
Circumflex scapular artery (*cut*)
Teres major muscle
Latissimus dorsi muscle

Superficial layer

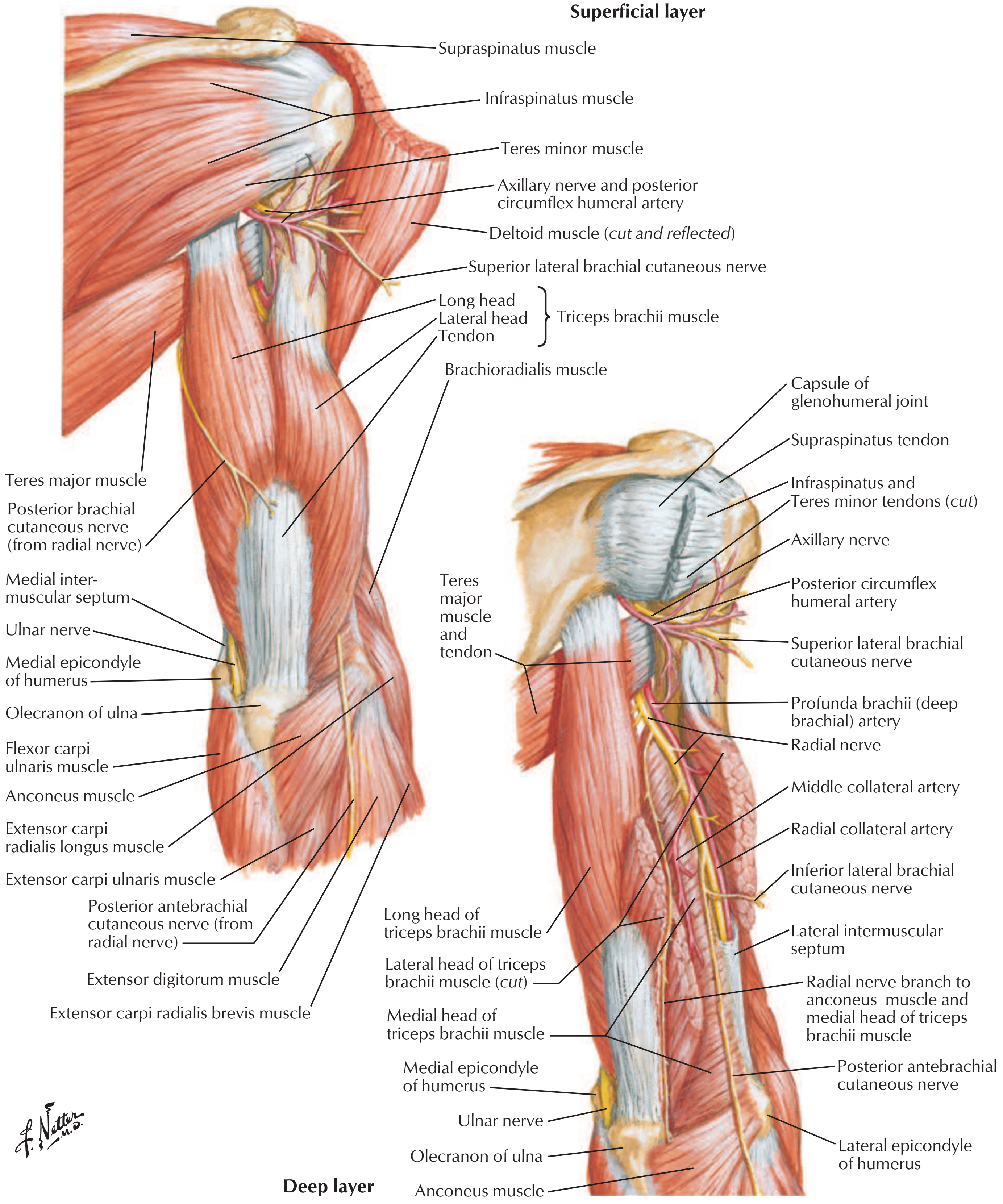


Biceps brachii tendons (*cut*)
Long head
Short head
Coracobrachialis muscle
Musculocutaneous nerve
Deltoid muscle (*cut*)
Brachialis muscle
Medial intermuscular septum
Lateral intermuscular septum
Lateral epicondyle of humerus
Lateral antebrachial cutaneous nerve
Medial epicondyle of humerus
Head of radius
Biceps brachii tendon
Radial tuberosity
Ulnar tuberosity

Deep layer

Muscles of Arm: Posterior Views

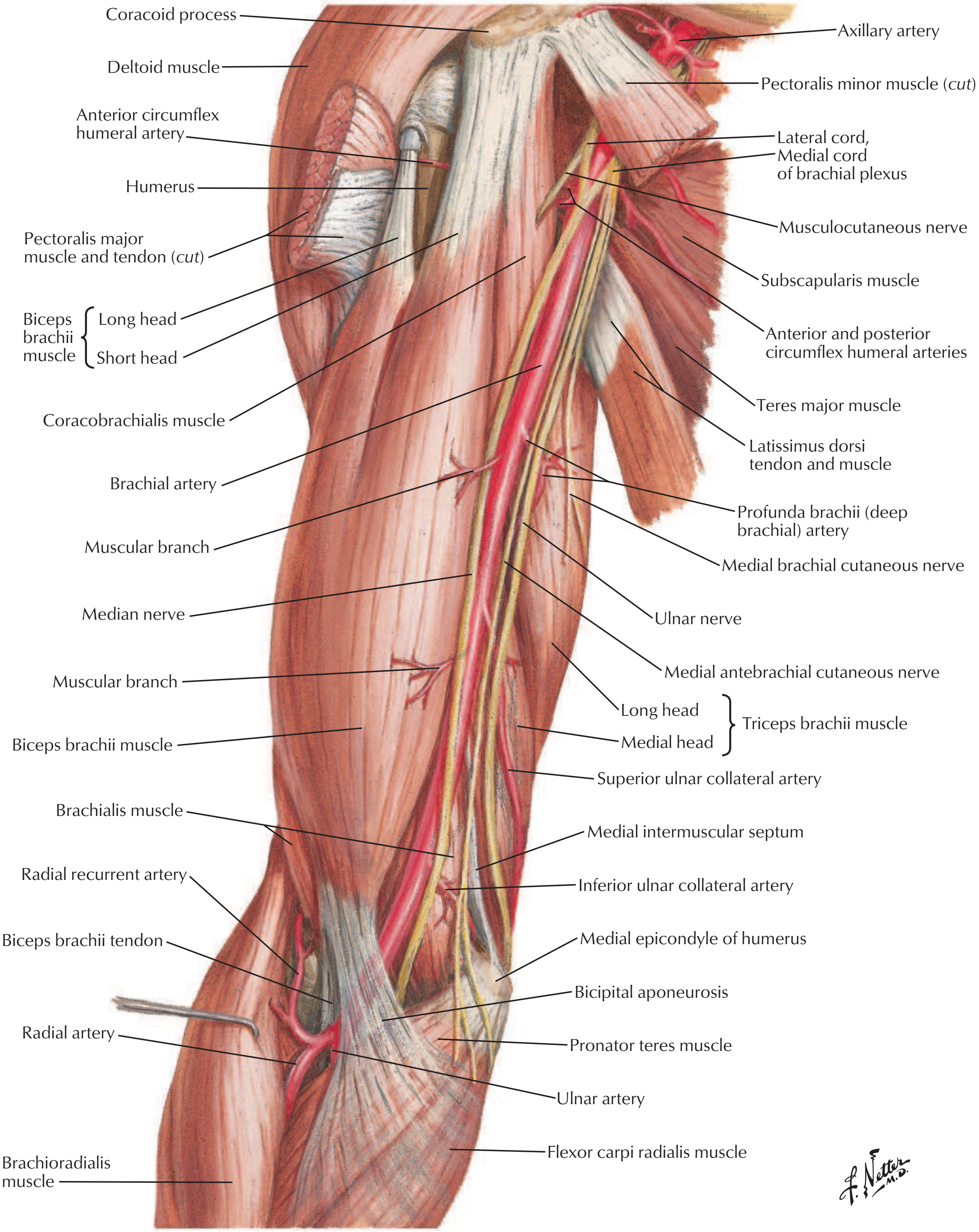
See also Plates 415, 468


Supraspinatus muscle
Infraspinatus muscle
Teres minor muscle
Axillary nerve and posterior circumflex humeral artery
Deltoid muscle (*cut and reflected*)
Superior lateral brachial cutaneous nerve
Long head
Lateral head
Tendon
Triceps brachii muscle
Brachioradialis muscle
Teres major muscle
Posterior brachial cutaneous nerve (from radial nerve)
Medial inter-muscular septum
Ulnar nerve
Medial epicondyle of humerus
Olecranon of ulna
Flexor carpi ulnaris muscle
Anconeus muscle
Extensor carpi radialis longus muscle
Extensor carpi ulnaris muscle
Posterior antebrachial cutaneous nerve (from radial nerve)
Extensor digitorum muscle
Extensor carpi radialis brevis muscle
F. Netter M.D.
Capsule of glenohumeral joint
Supraspinatus tendon
Infraspinatus and Teres minor tendons (*cut*)
Axillary nerve
Posterior circumflex humeral artery
Superior lateral brachial cutaneous nerve
Teres major muscle and tendon
Profunda brachii (deep brachial) artery
Radial nerve
Middle collateral artery
Radial collateral artery
Inferior lateral brachial cutaneous nerve
Lateral intermuscular septum
Long head of triceps brachii muscle
Lateral head of triceps brachii muscle (*cut*)
Radial nerve branch to anconeus muscle and medial head of triceps brachii muscle
Medial head of triceps brachii muscle
Posterior antebrachial cutaneous nerve
Medial epicondyle of humerus
Ulnar nerve
Lateral epicondyle of humerus
Olecranon of ulna
Anconeus muscle

Superficial layer

Deep layer

Brachial Artery in Situ

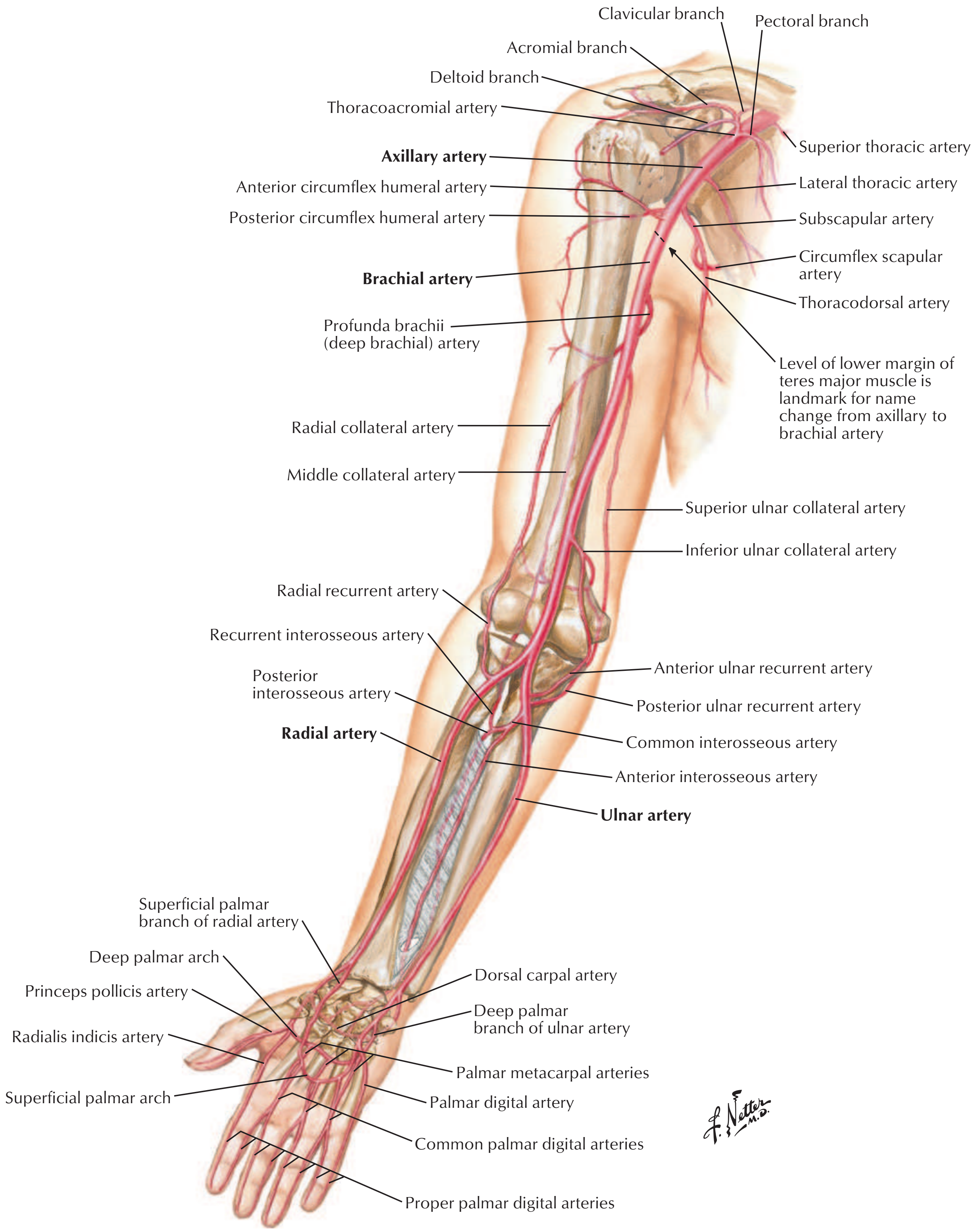


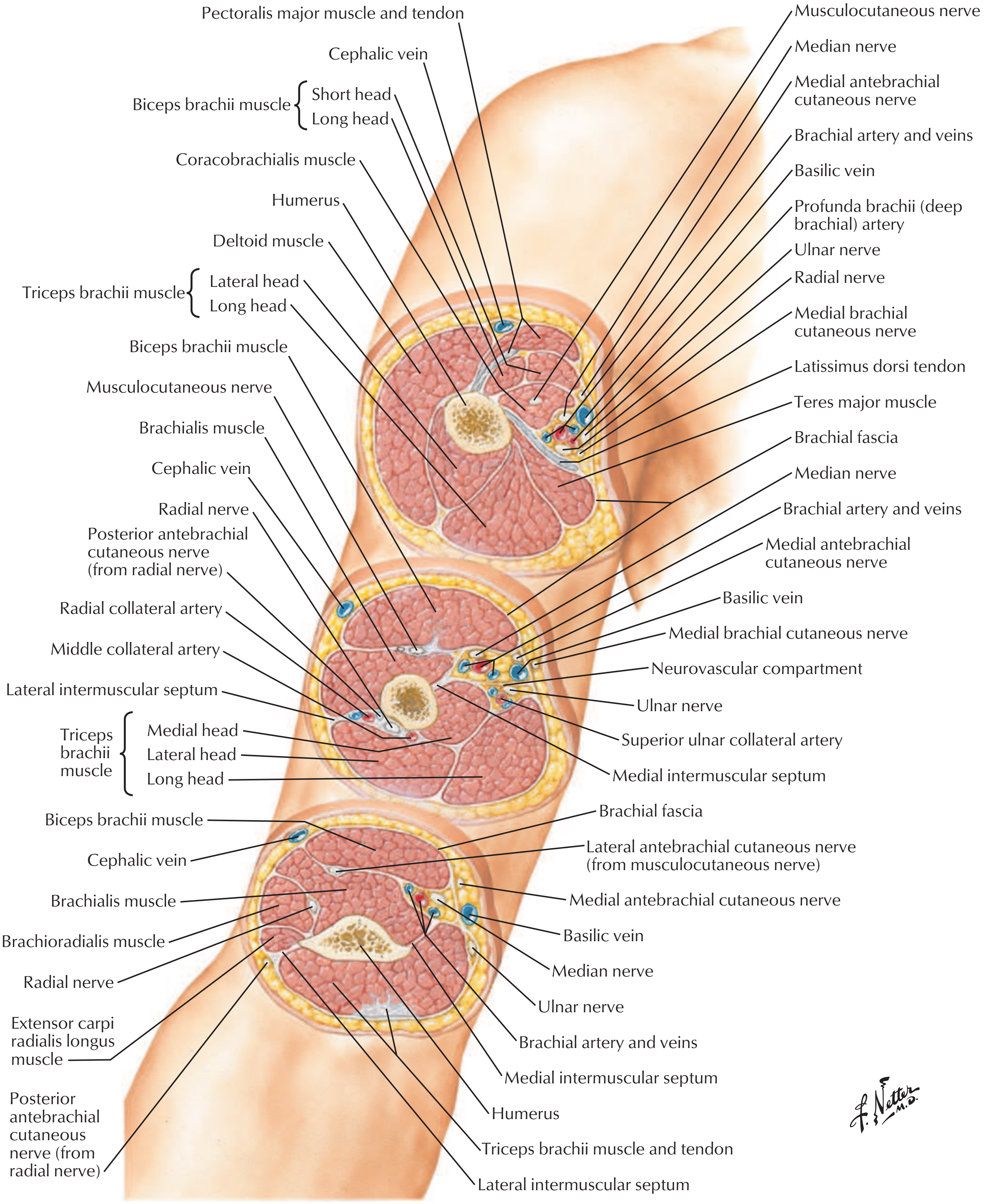
Coracoid process
Deltoid muscle
Anterior circumflex humeral artery
Humerus
Pectoralis major muscle and tendon (*cut*)
Biceps brachii muscle
Long head
Short head
Coracobrachialis muscle
Brachial artery
Muscular branch
Median nerve
Muscular branch
Biceps brachii muscle
Brachialis muscle
Radial recurrent artery
Biceps brachii tendon
Radial artery
Brachioradialis muscle
Axillary artery
Pectoralis minor muscle (*cut*)
Lateral cord, Medial cord of brachial plexus
Musculocutaneous nerve
Subscapularis muscle
Anterior and posterior circumflex humeral arteries
Teres major muscle
Latissimus dorsi tendon and muscle
Profunda brachii (deep brachial) artery
Medial brachial cutaneous nerve
Ulnar nerve
Medial antebrachial cutaneous nerve
Long head
Medial head
Triceps brachii muscle
Superior ulnar collateral artery
Medial intermuscular septum
Inferior ulnar collateral artery
Medial epicondyle of humerus
Bicipital aponeurosis
Pronator teres muscle
Ulnar artery
Flexor carpi radialis muscle
F. Netter M.D.

Arteries of Arm and Proximal Forearm

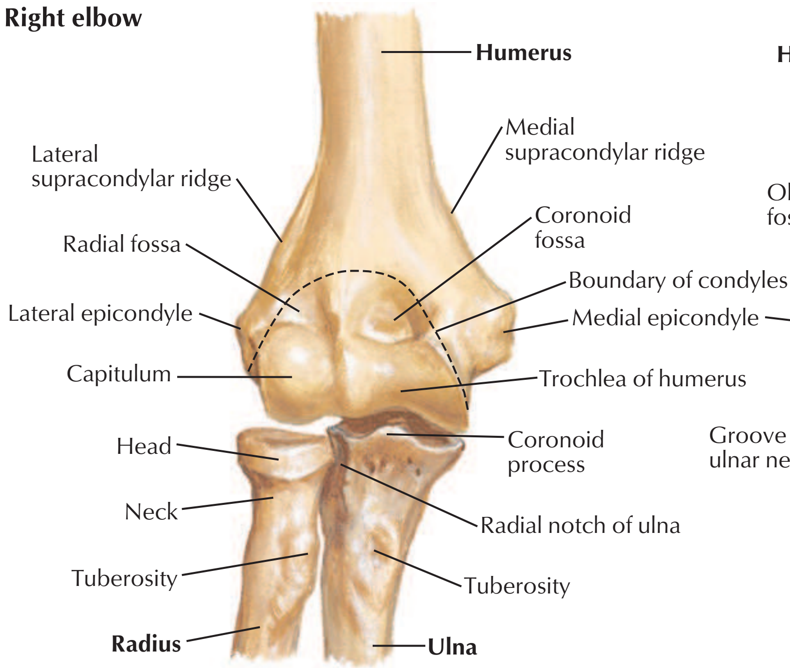
See also **Plates** 437, 456

Arm

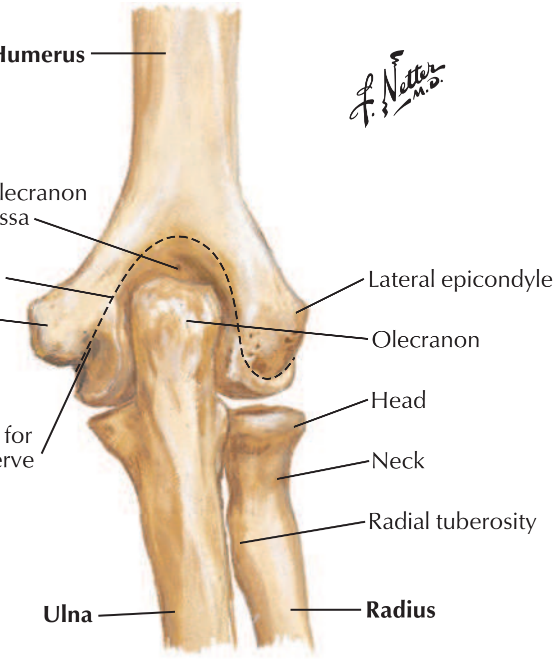

Clavicular branch
Pectoral branch
Acromial branch
Deltoid branch
Thoracoacromial artery
Superior thoracic artery
Axillary artery
Anterior circumflex humeral artery
Lateral thoracic artery
Posterior circumflex humeral artery
Subscapular artery
Circumflex scapular artery
Brachial artery
Thoracodorsal artery
Profunda brachii (deep brachial) artery
Level of lower margin of teres major muscle is landmark for name change from axillary to brachial artery
Radial collateral artery
Middle collateral artery
Superior ulnar collateral artery
Inferior ulnar collateral artery
Radial recurrent artery
Recurrent interosseous artery
Anterior ulnar recurrent artery
Posterior interosseous artery
Posterior ulnar recurrent artery
Radial artery
Common interosseous artery
Anterior interosseous artery
Ulnar artery
Superficial palmar branch of radial artery
Deep palmar arch
Dorsal carpal artery
Princeps pollicis artery
Deep palmar branch of ulnar artery
Radialis indicis artery
Palmar metacarpal arteries
Superficial palmar arch
Palmar digital artery
Common palmar digital arteries
Proper palmar digital arteries
F. Netter M.D.


Pectoralis major muscle and tendon
Cephalic vein
Biceps brachii muscle
Short head
Long head
Coracobrachialis muscle
Humerus
Deltoid muscle
Triceps brachii muscle
Lateral head
Long head
Biceps brachii muscle
Musculocutaneous nerve
Brachialis muscle
Cephalic vein
Radial nerve
Posterior antebrachial cutaneous nerve (from radial nerve)
Radial collateral artery
Middle collateral artery
Lateral intermuscular septum
Triceps brachii muscle
Medial head
Lateral head
Long head
Biceps brachii muscle
Cephalic vein
Brachialis muscle
Brachioradialis muscle
Radial nerve
Extensor carpi radialis longus muscle
Posterior antebrachial cutaneous nerve (from radial nerve)
Musculocutaneous nerve
Median nerve
Medial antebrachial cutaneous nerve
Brachial artery and veins
Basilic vein
Profunda brachii (deep brachial) artery
Ulnar nerve
Radial nerve
Medial brachial cutaneous nerve
Latissimus dorsi tendon
Teres major muscle
Brachial fascia
Median nerve
Brachial artery and veins
Medial antebrachial cutaneous nerve
Basilic vein
Medial brachial cutaneous nerve
Neurovascular compartment
Ulnar nerve
Superior ulnar collateral artery
Medial intermuscular septum
Brachial fascia
Lateral antebrachial cutaneous nerve (from musculocutaneous nerve)
Medial antebrachial cutaneous nerve
Basilic vein
Median nerve
Ulnar nerve
Brachial artery and veins
Medial intermuscular septum
Humerus
Triceps brachii muscle and tendon
Lateral intermuscular septum

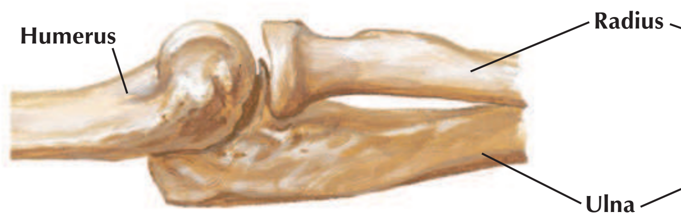
Right elbow


Humerus
Medial supracondylar ridge
Lateral supracondylar ridge
Coronoid fossa
Radial fossa
Boundary of condyles
Lateral epicondyle
Medial epicondyle
Capitulum
Trochlea of humerus
Head
Coronoid process
Neck
Radial notch of ulna
Tuberosity
Tuberosity
Radius
Ulna

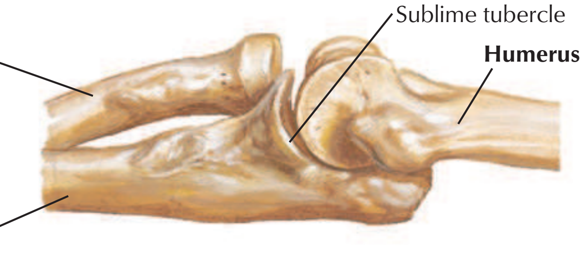
In extension: anterior view


Humerus
F. Netter M.D.
Olecranon fossa
Lateral epicondyle
Olecranon
Head
Groove for ulnar nerve
Neck
Radial tuberosity
Ulna
Radius

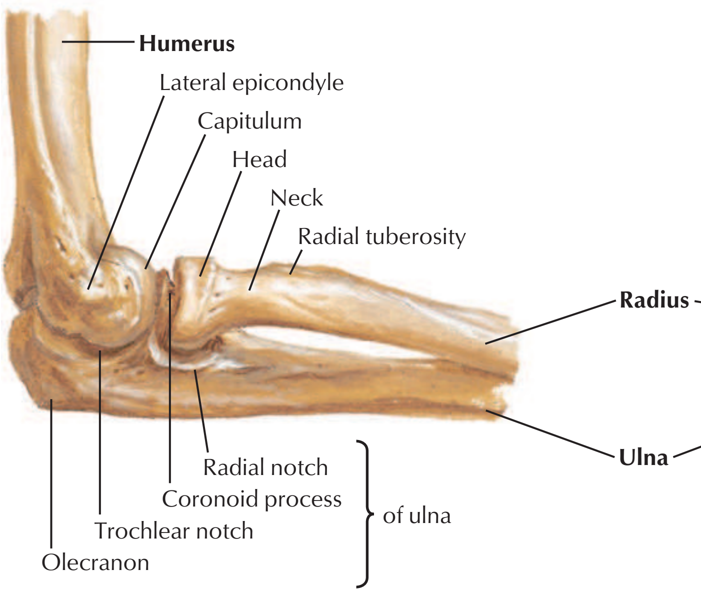
In extension: posterior view


Humerus
Radius
Ulna

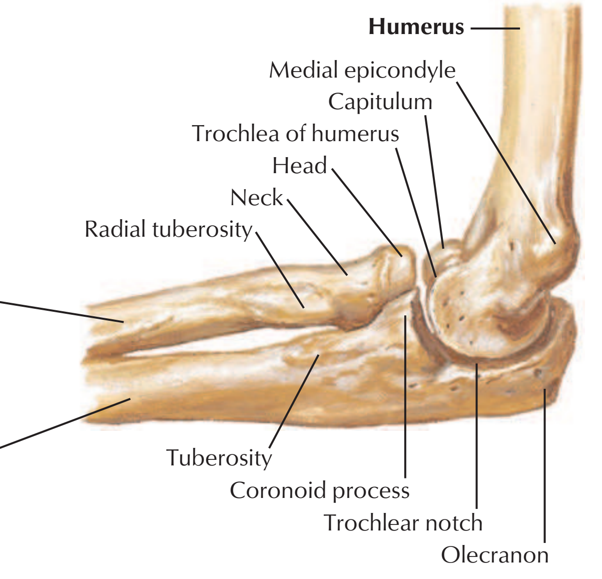
In extension: lateral view


Sublime tubercle
Humerus

In extension: medial view

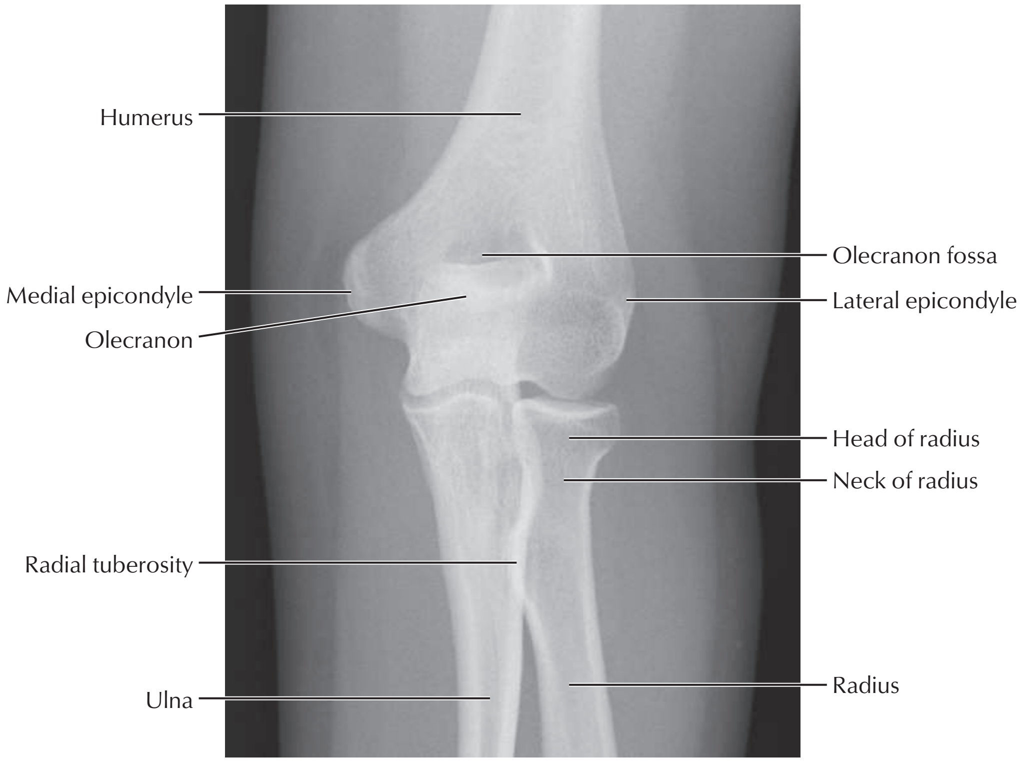

Humerus
Lateral epicondyle
Capitulum
Head
Neck
Radial tuberosity
Radius
Ulna
Radial notch
Coronoid process
Trochlear notch
Olecranon
of ulna

In 90 degrees of flexion: lateral view

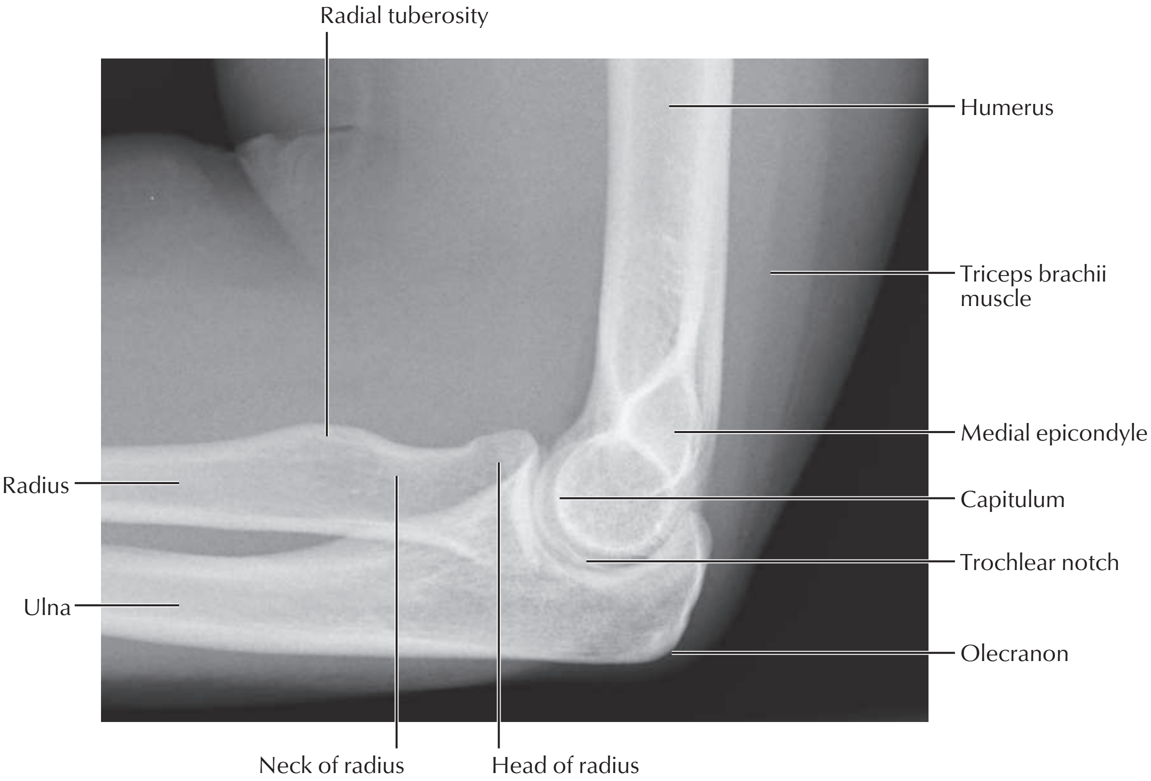

Humerus
Medial epicondyle
Capitulum
Trochlea of humerus
Head
Neck
Radial tuberosity
Tuberosity
Coronoid process
Trochlear notch
Olecranon

In 90 degrees of flexion: medial view

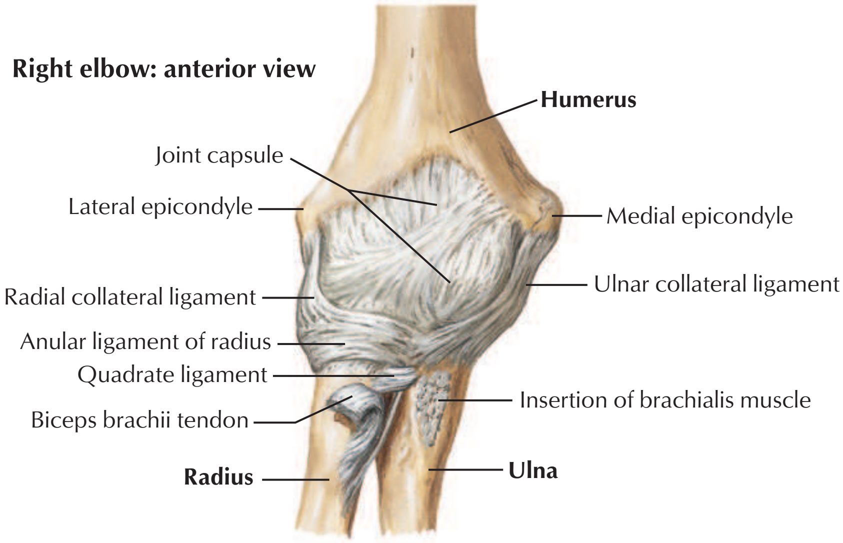
Anteroposterior view


Humerus
Olecranon fossa
Medial epicondyle
Lateral epicondyle
Olecranon
Head of radius
Neck of radius
Radial tuberosity
Radius
Ulna

Lateral view


Radial tuberosity
Humerus
Triceps brachii muscle
Medial epicondyle
Radius
Capitulum
Trochlear notch
Ulna
Olecranon
Neck of radius
Head of radius

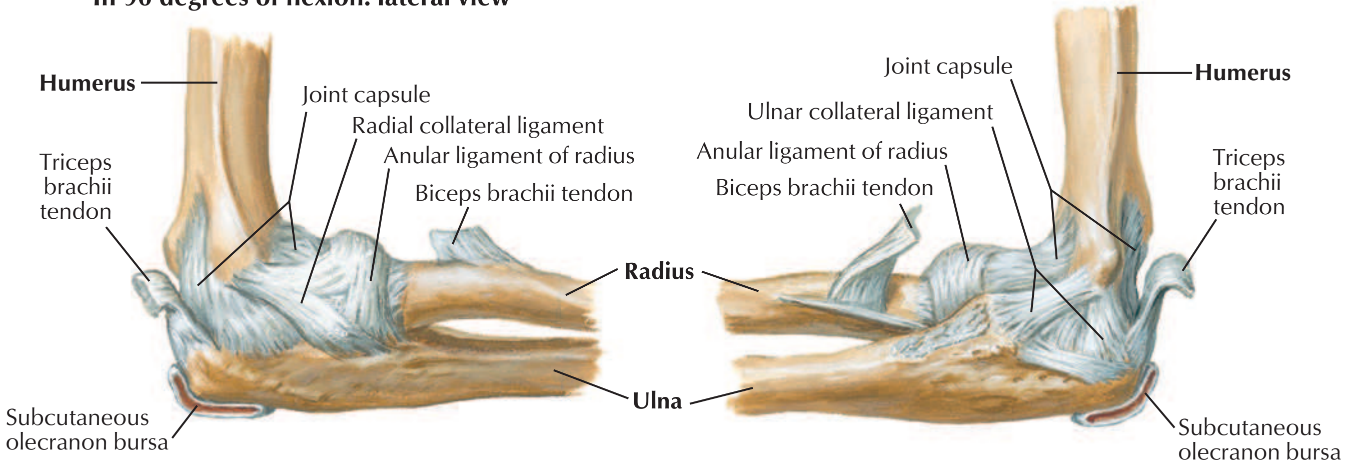
Right elbow: anterior view


Humerus
Joint capsule
Lateral epicondyle
Medial epicondyle
Radial collateral ligament
Ulnar collateral ligament
Anular ligament of radius
Quadrate ligament
Insertion of brachialis muscle
Biceps brachii tendon
Radius
Ulna

F. Netter M.D.

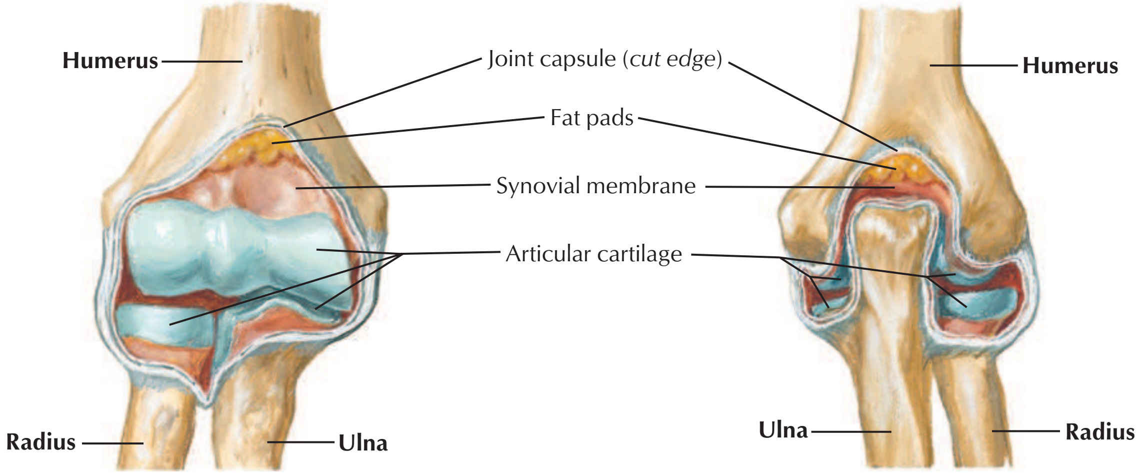
In 90 degrees of flexion: lateral view

In 90 degrees of flexion: medial view


Humerus
Joint capsule
Radial collateral ligament
Triceps brachii tendon
Anular ligament of radius
Biceps brachii tendon
Radius
Ulna
Subcutaneous olecranon bursa
Joint capsule
Humerus
Ulnar collateral ligament
Anular ligament of radius
Triceps brachii tendon
Biceps brachii tendon
Subcutaneous olecranon bursa

Opened joint: anterior view

Opened joint: posterior view

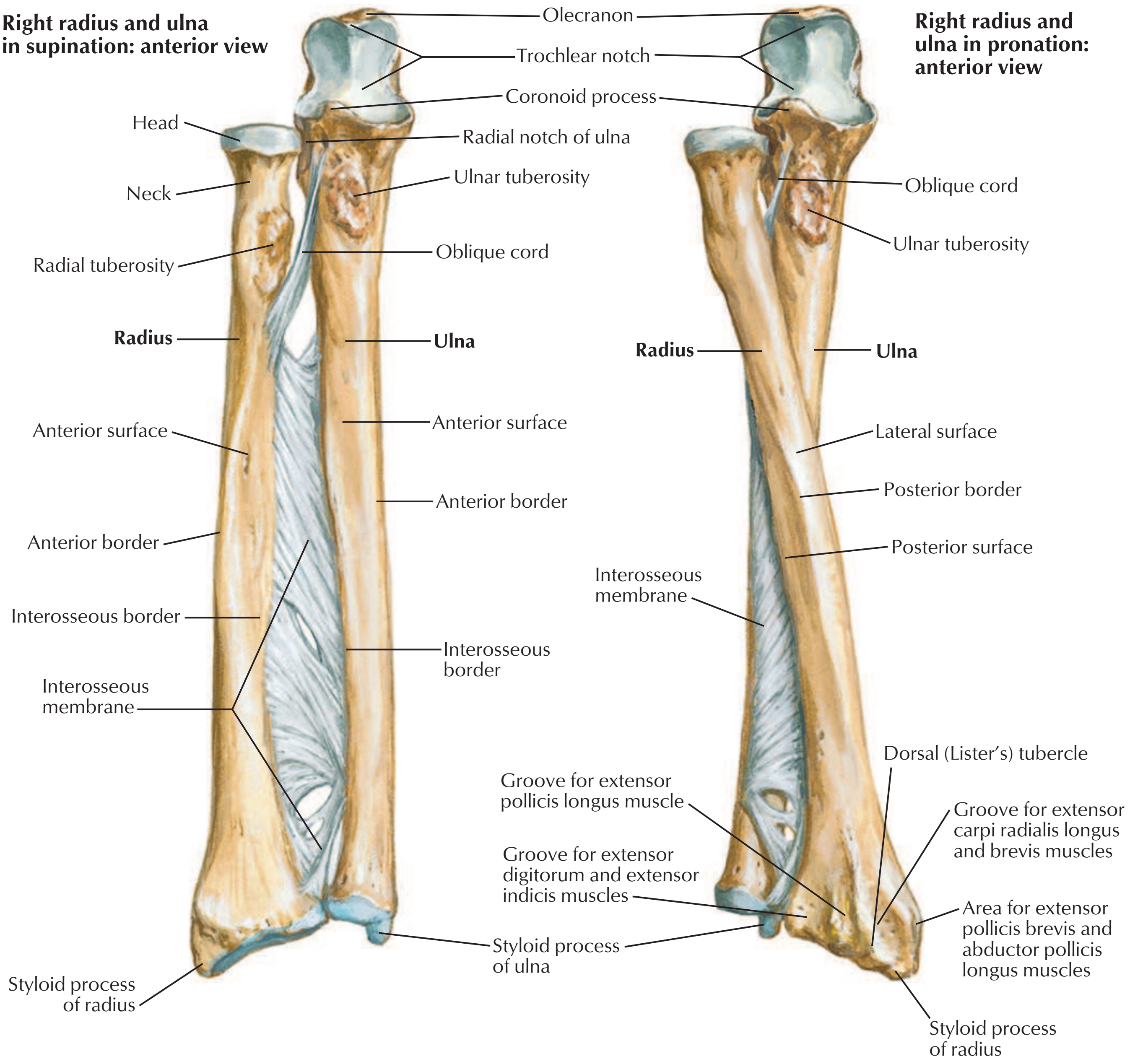

Humerus
Joint capsule (*cut edge*)
Humerus
Fat pads
Synovial membrane
Articular cartilage
Radius
Ulna
Ulna
Radius

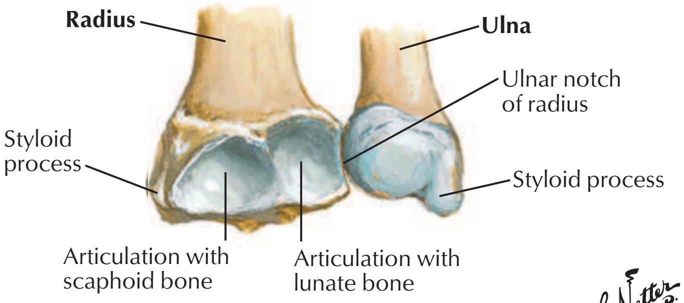
Bones of Forearm

See also Plate 440

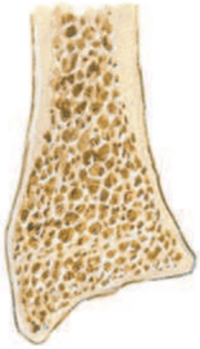
Right radius and ulna in supination: anterior view

Right radius and ulna in pronation: anterior view


Olecranon
Trochlear notch
Coronoid process
Head
Radial notch of ulna
Neck
Ulnar tuberosity
Radial tuberosity
Oblique cord
Radius
Ulna
Anterior surface
Anterior surface
Anterior border
Anterior border
Interosseous border
Interosseous membrane
Interosseous border
Styloid process of radius
Styloid process of ulna
Oblique cord
Ulnar tuberosity
Radius
Ulna
Lateral surface
Posterior border
Posterior surface
Interosseous membrane
Dorsal (Lister's) tubercle
Groove for extensor pollicis longus muscle
Groove for extensor carpi radialis longus and brevis muscles
Groove for extensor digitorum and extensor indicis muscles
Area for extensor pollicis brevis and abductor pollicis longus muscles
Styloid process of radius

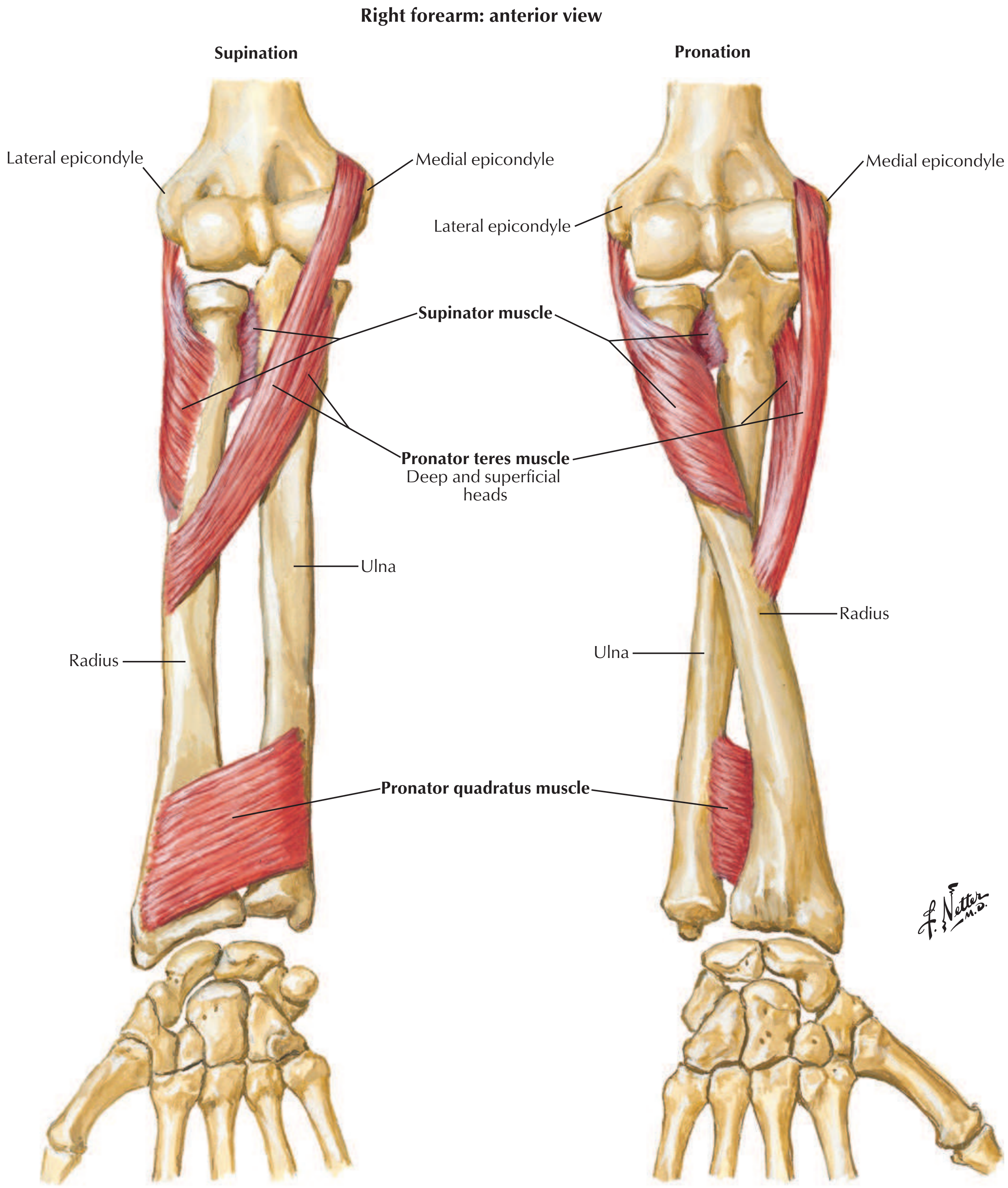

Radius
Ulna
Ulnar notch of radius
Styloid process
Styloid process
Articulation with scaphoid bone
Articulation with lunate bone

Carpal articular surface



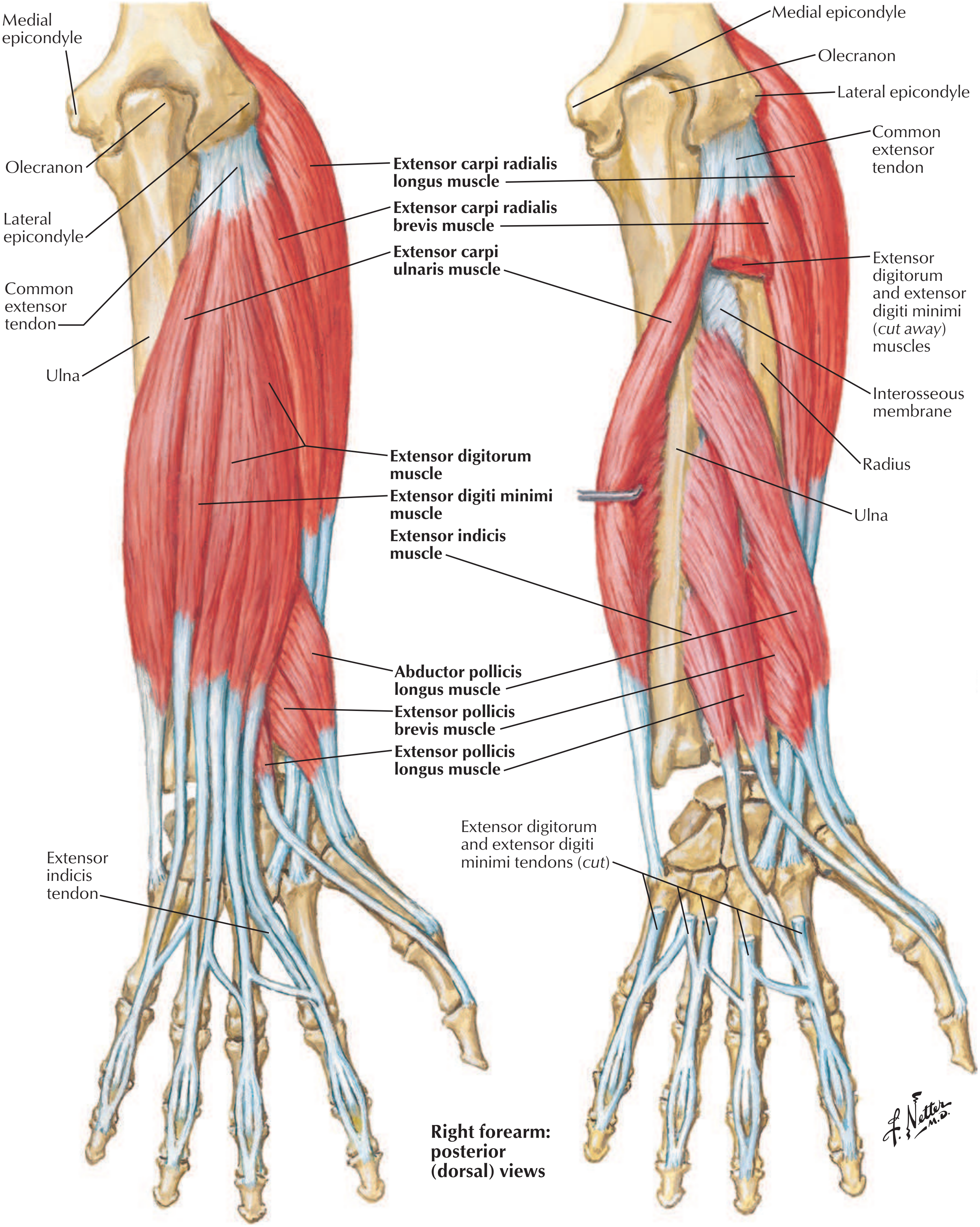
Coronal section of radius demonstrates how thickness of cortical bone of body of radius diminishes to thin layer over cancellous bone at distal end

See also Plate 438

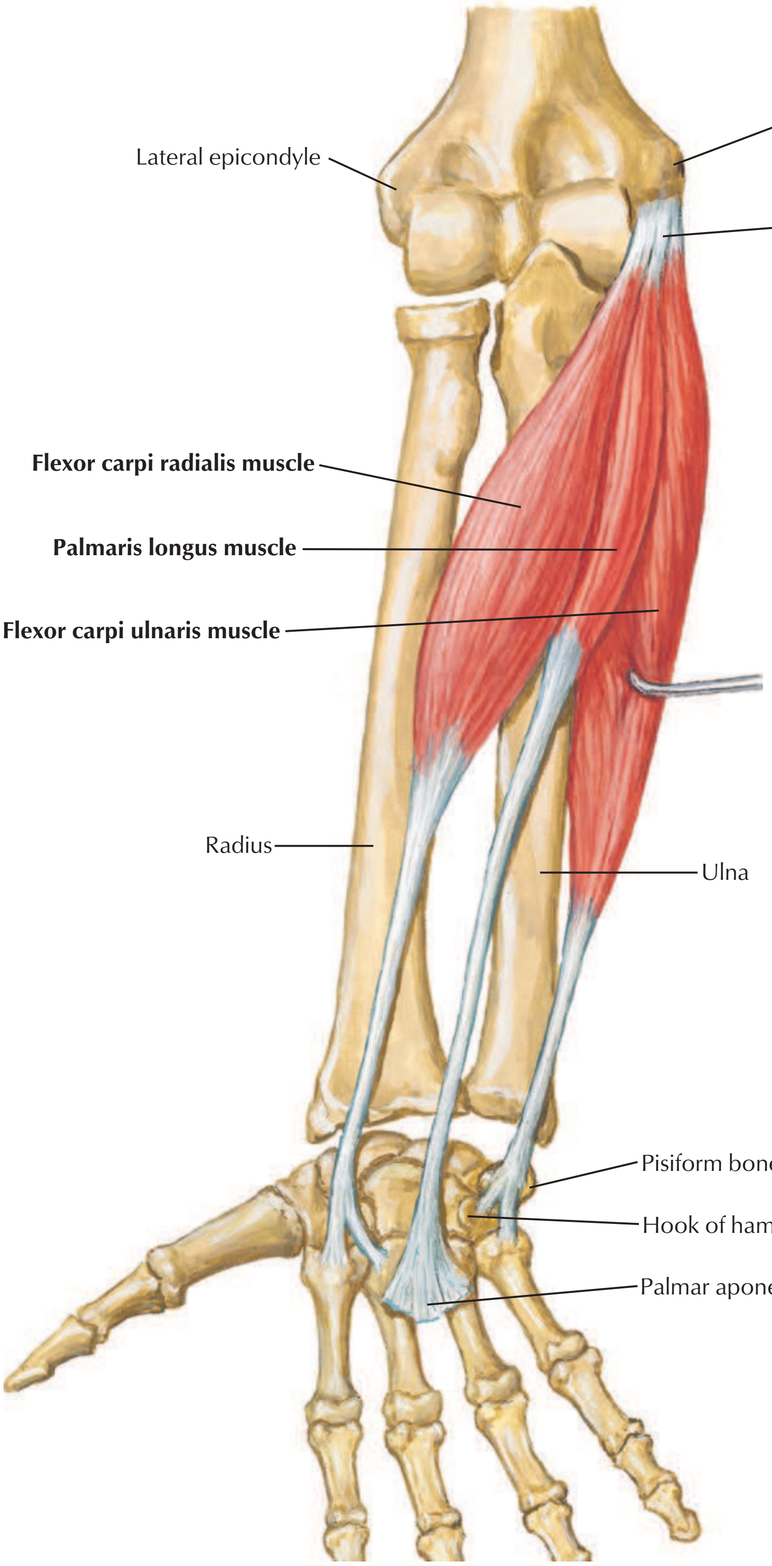

Right forearm: anterior view
Supination
Pronation
Lateral epicondyle
Medial epicondyle
Lateral epicondyle
Medial epicondyle
Supinator muscle
Pronator teres muscle
Deep and superficial heads
Ulna
Radius
Radius
Ulna
Pronator quadratus muscle
F. Netter M.D.

Individual Muscles of Forearm: Extensors of Wrist and Digits

See also Plate 441

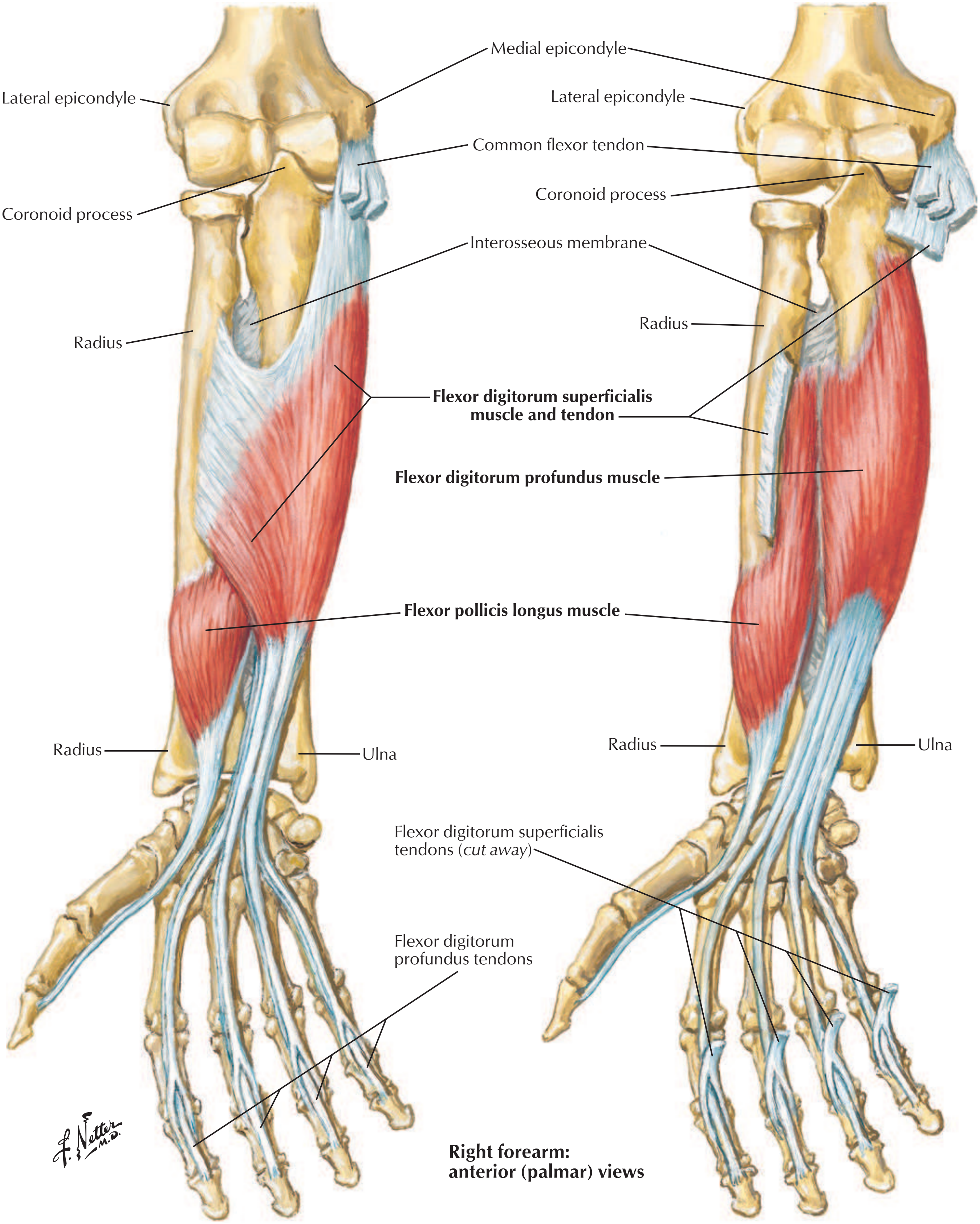

Medial epicondyle
Olecranon
Lateral epicondyle
Common extensor tendon
Ulna
Extensor carpi radialis longus muscle
Extensor carpi radialis brevis muscle
Extensor carpi ulnaris muscle
Extensor digitorum muscle
Extensor digiti minimi muscle
Extensor indicis muscle
Abductor pollicis longus muscle
Extensor pollicis brevis muscle
Extensor pollicis longus muscle
Extensor indicis tendon
Medial epicondyle
Olecranon
Lateral epicondyle
Common extensor tendon
Extensor digitorum and extensor digiti minimi (*cut away*) muscles
Interosseous membrane
Radius
Ulna
Extensor digitorum and extensor digiti minimi tendons (*cut*)

Right forearm: posterior (dorsal) views


Lateral epicondyle
Medial epicondyle
Common flexor tendon
Flexor carpi radialis muscle
Palmaris longus muscle
Flexor carpi ulnaris muscle
Radius
Ulna
Pisiform bone
Hook of hamate bone
Palmar aponeurosis (*cut*)

Right forearm:
anterior (palmar) view

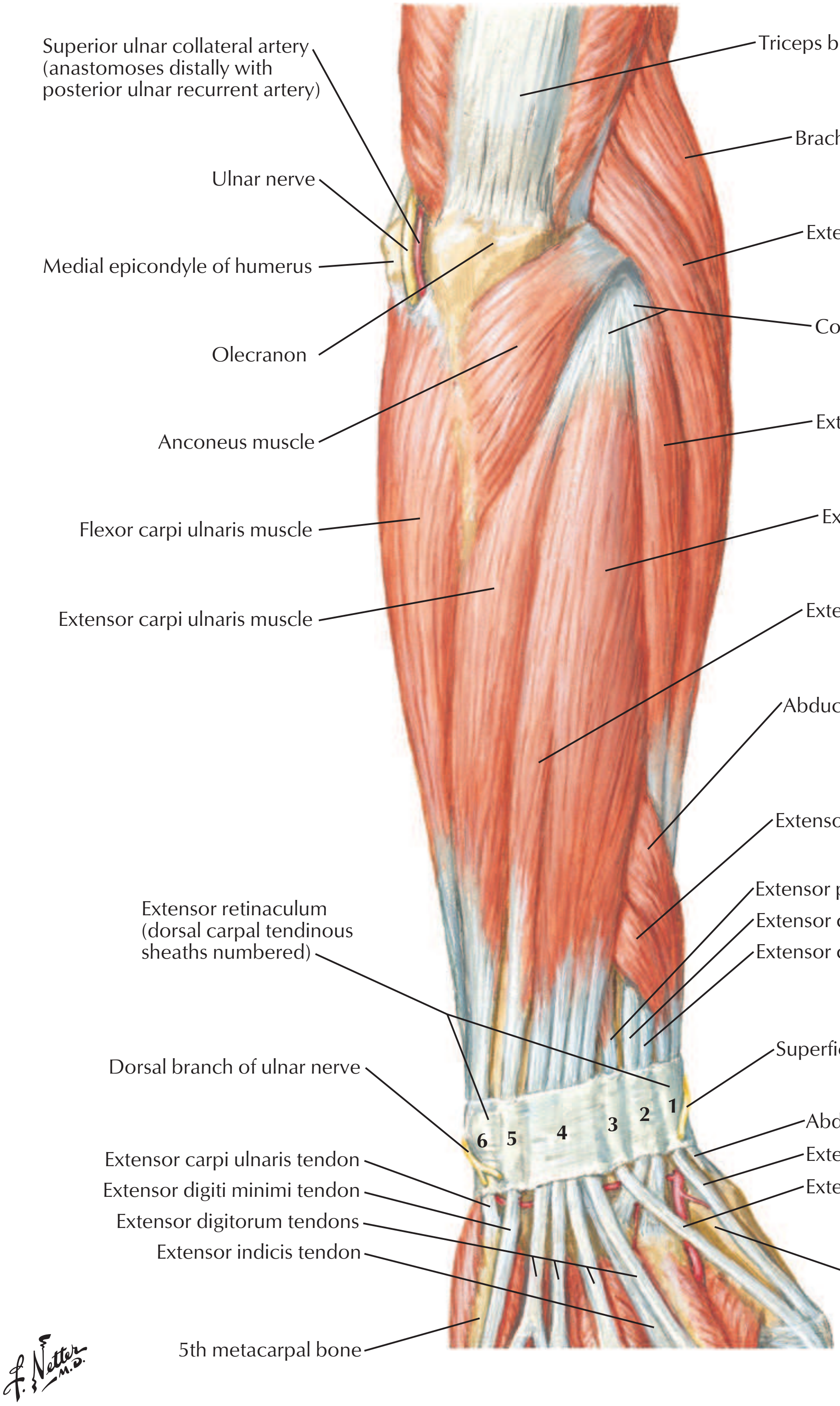
F. Netter M.D.


Medial epicondyle
Lateral epicondyle
Lateral epicondyle
Common flexor tendon
Coronoid process
Coronoid process
Interosseous membrane
Radius
Radius
Flexor digitorum superficialis muscle and tendon
Flexor digitorum profundus muscle
Flexor pollicis longus muscle
Radius
Ulna
Radius
Ulna
Flexor digitorum superficialis tendons (*cut away*)
Flexor digitorum profundus tendons
F. Netter M.D.

Right forearm: anterior (palmar) views

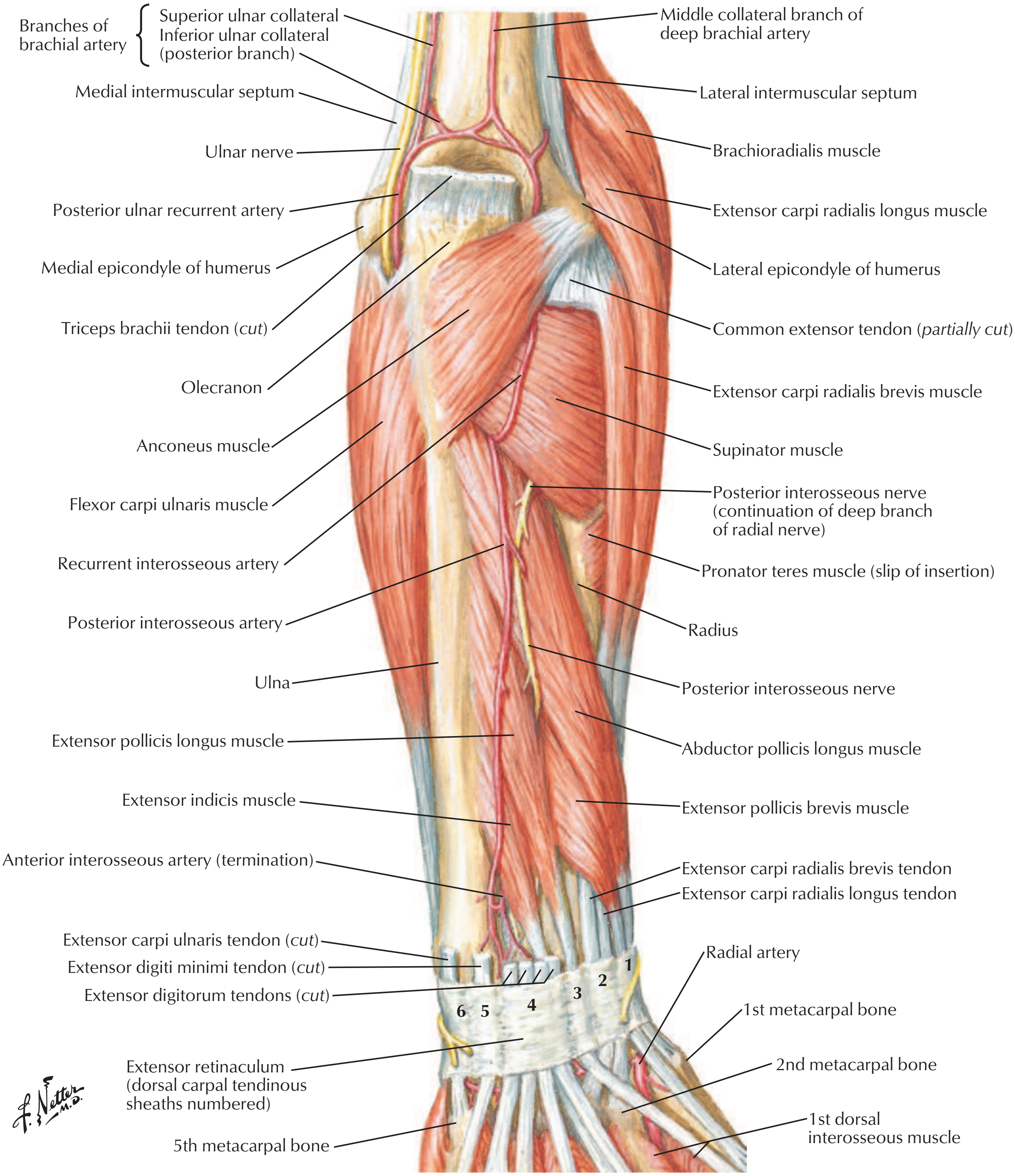
Muscles of Forearm (Superficial Layer): Posterior View

See also Plates 460, 469


Superior ulnar collateral artery (anastomoses distally with posterior ulnar recurrent artery)
Ulnar nerve
Medial epicondyle of humerus
Olecranon
Anconeus muscle
Flexor carpi ulnaris muscle
Extensor carpi ulnaris muscle
Extensor retinaculum (dorsal carpal tendinous sheaths numbered)
Dorsal branch of ulnar nerve
Extensor carpi ulnaris tendon
Extensor digiti minimi tendon
Extensor digitorum tendons
Extensor indicis tendon
5th metacarpal bone
Triceps brachii tendon
Brachioradialis muscle
Extensor carpi radialis longus muscle
Common extensor tendon
Extensor carpi radialis brevis muscle
Extensor digitorum muscle
Extensor digiti minimi muscle
Abductor pollicis longus muscle
Extensor pollicis brevis muscle
Extensor pollicis longus tendon
Extensor carpi radialis brevis tendon
Extensor carpi radialis longus tendon
Superficial branch of radial nerve
Abductor pollicis longus tendon
Extensor pollicis brevis tendon
Extensor pollicis longus tendon
Anatomical snuffbox
6
5
4
3
2
1

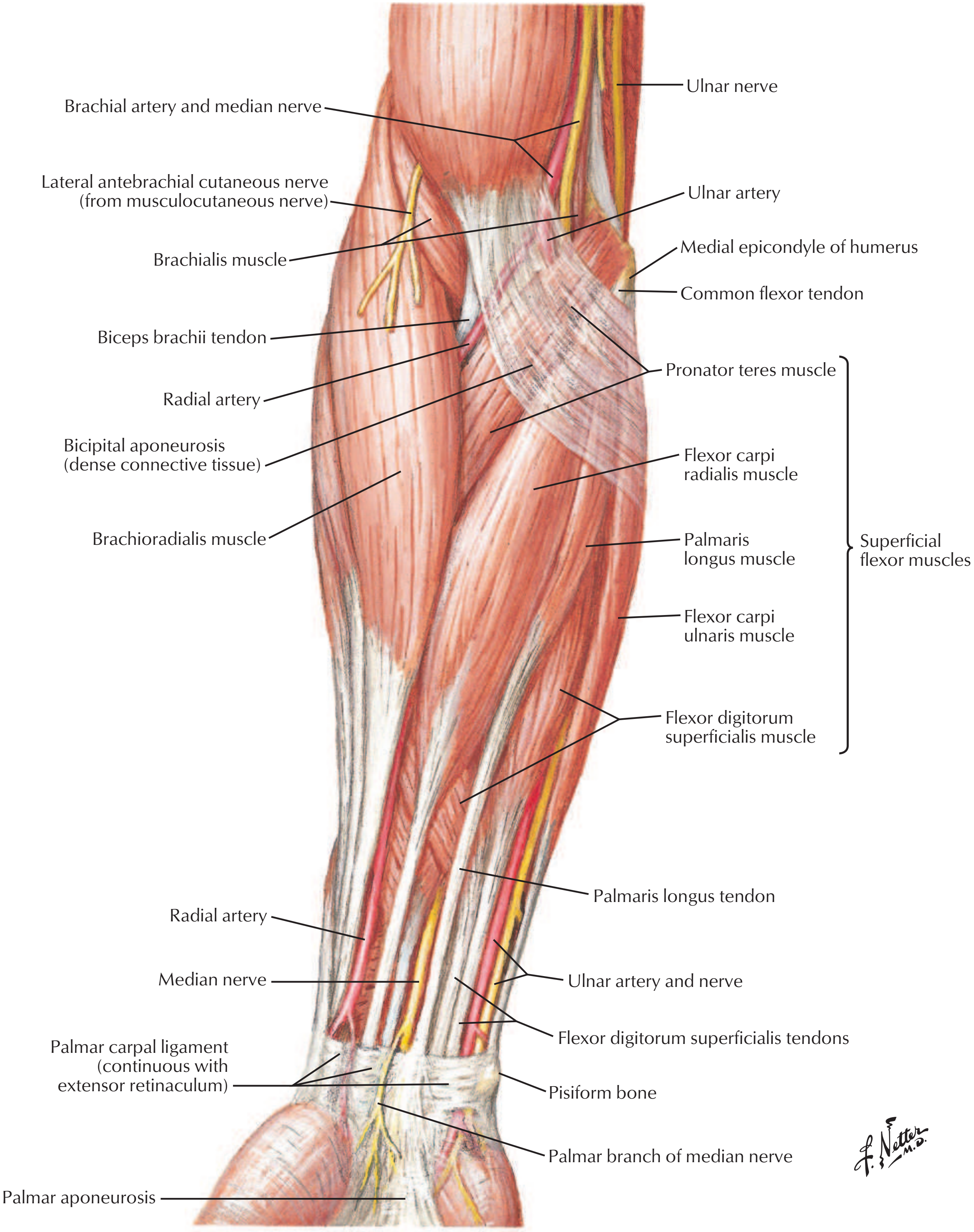
Muscles of Forearm (Deeper Layer): Posterior View

See also **Plate 460**


Branches of brachial artery
Superior ulnar collateral
Inferior ulnar collateral (posterior branch)
Medial intermuscular septum
Ulnar nerve
Posterior ulnar recurrent artery
Medial epicondyle of humerus
Triceps brachii tendon (*cut*)
Olecranon
Anconeus muscle
Flexor carpi ulnaris muscle
Recurrent interosseous artery
Posterior interosseous artery
Ulna
Extensor pollicis longus muscle
Extensor indicis muscle
Anterior interosseous artery (termination)
Extensor carpi ulnaris tendon (*cut*)
Extensor digiti minimi tendon (*cut*)
Extensor digitorum tendons (*cut*)
Extensor retinaculum (dorsal carpal tendinous sheaths numbered)
5th metacarpal bone
Middle collateral branch of deep brachial artery
Lateral intermuscular septum
Brachioradialis muscle
Extensor carpi radialis longus muscle
Lateral epicondyle of humerus
Common extensor tendon (*partially cut*)
Extensor carpi radialis brevis muscle
Supinator muscle
Posterior interosseous nerve (continuation of deep branch of radial nerve)
Pronator teres muscle (slip of insertion)
Radius
Posterior interosseous nerve
Abductor pollicis longus muscle
Extensor pollicis brevis muscle
Extensor carpi radialis brevis tendon
Extensor carpi radialis longus tendon
Radial artery
1st metacarpal bone
2nd metacarpal bone
1st dorsal interosseous muscle
1
2
3
4
5
6

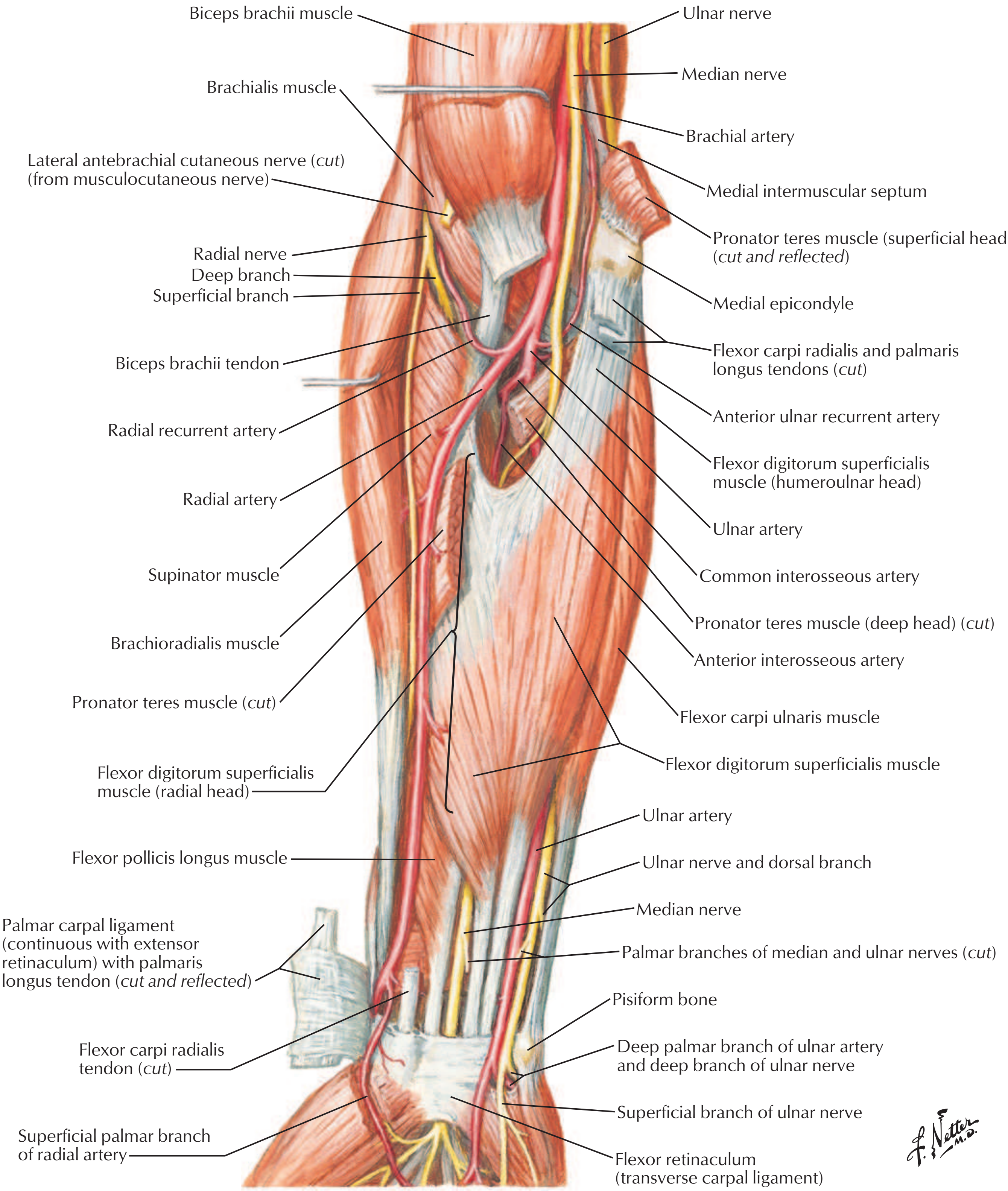
Muscles of Forearm (Superficial Layer): Anterior View

See also Plates 466, 467


Brachial artery and median nerve
Lateral antebrachial cutaneous nerve (from musculocutaneous nerve)
Brachialis muscle
Biceps brachii tendon
Radial artery
Bicipital aponeurosis (dense connective tissue)
Brachioradialis muscle
Ulnar nerve
Ulnar artery
Medial epicondyle of humerus
Common flexor tendon
Pronator teres muscle
Flexor carpi radialis muscle
Palmaris longus muscle
Flexor carpi ulnaris muscle
Flexor digitorum superficialis muscle
Superficial flexor muscles
Palmaris longus tendon
Radial artery
Median nerve
Ulnar artery and nerve
Flexor digitorum superficialis tendons
Palmar carpal ligament (continuous with extensor retinaculum)
Pisiform bone
Palmar branch of median nerve
Palmar aponeurosis
F. Netter M.D.

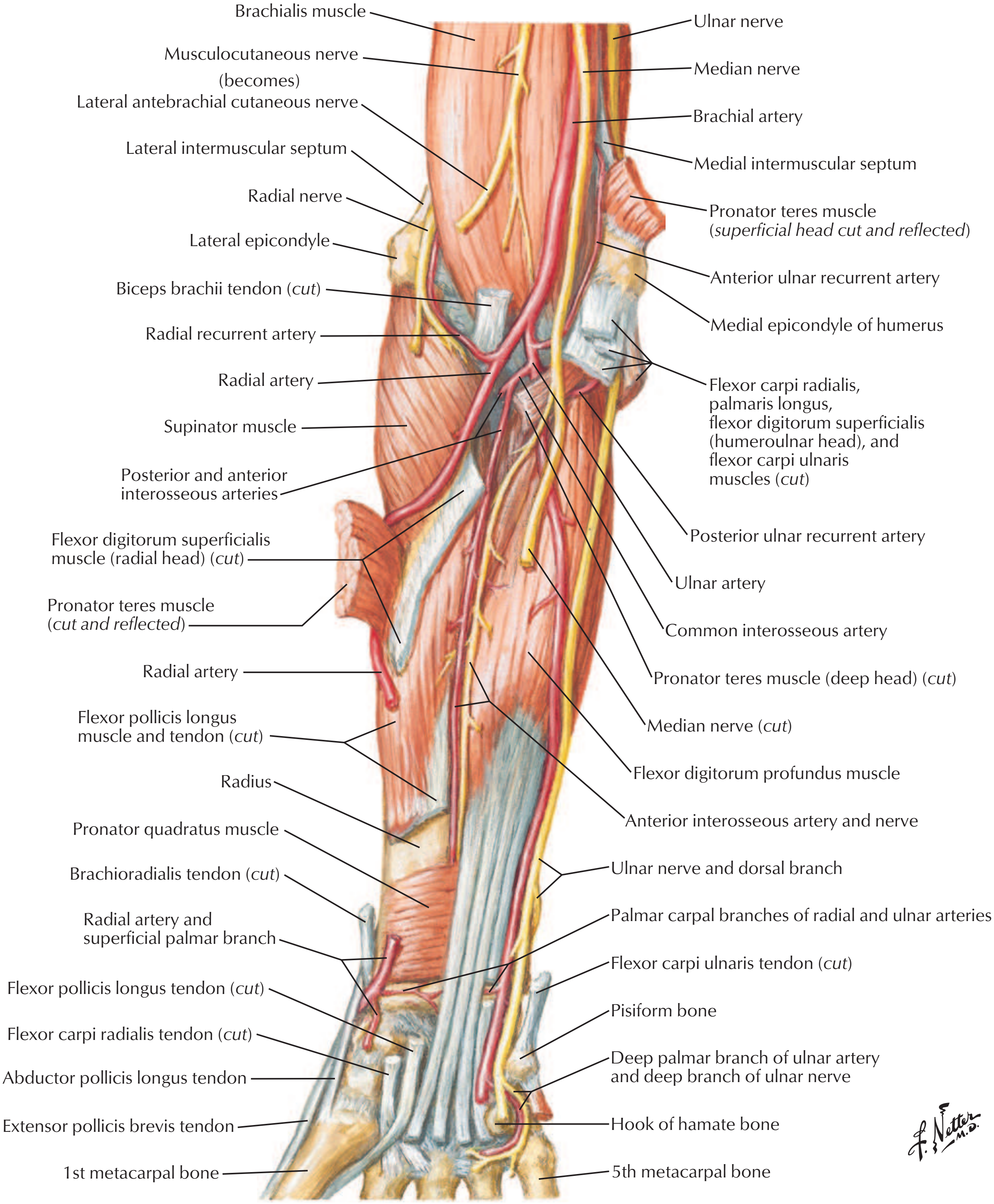
Muscles of Forearm (Intermediate Layer): Anterior View

See also Plates 424, 466

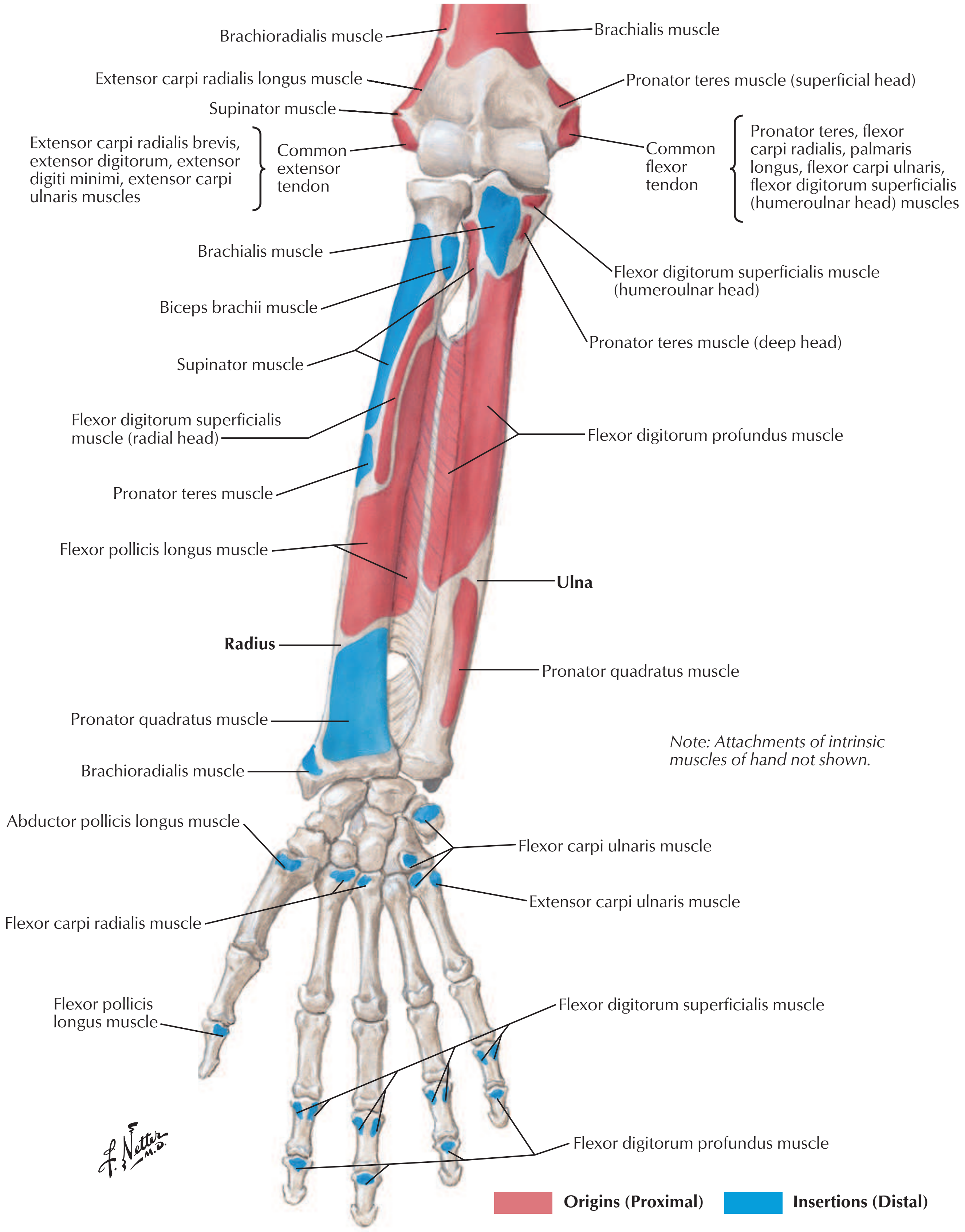

Biceps brachii muscle
Brachialis muscle
Lateral antebrachial cutaneous nerve (*cut*) (from musculocutaneous nerve)
Radial nerve
Deep branch
Superficial branch
Biceps brachii tendon
Radial recurrent artery
Radial artery
Supinator muscle
Brachioradialis muscle
Pronator teres muscle (*cut*)
Flexor digitorum superficialis muscle (radial head)
Flexor pollicis longus muscle
Palmar carpal ligament (continuous with extensor retinaculum) with palmaris longus tendon (*cut and reflected*)
Flexor carpi radialis tendon (*cut*)
Superficial palmar branch of radial artery
Ulnar nerve
Median nerve
Brachial artery
Medial intermuscular septum
Pronator teres muscle (superficial head) (*cut and reflected*)
Medial epicondyle
Flexor carpi radialis and palmaris longus tendons (*cut*)
Anterior ulnar recurrent artery
Flexor digitorum superficialis muscle (humeroulnar head)
Ulnar artery
Common interosseous artery
Pronator teres muscle (deep head) (*cut*)
Anterior interosseous artery
Flexor carpi ulnaris muscle
Flexor digitorum superficialis muscle
Ulnar artery
Ulnar nerve and dorsal branch
Median nerve
Palmar branches of median and ulnar nerves (*cut*)
Pisiform bone
Deep palmar branch of ulnar artery and deep branch of ulnar nerve
Superficial branch of ulnar nerve
Flexor retinaculum (transverse carpal ligament)
F. Netter M.D.

Muscles of Forearm (Deep Layer): Anterior View

See also Plates 421, 467


Brachialis muscle
Musculocutaneous nerve
(becomes)
Lateral antebrachial cutaneous nerve
Lateral intermuscular septum
Radial nerve
Lateral epicondyle
Biceps brachii tendon (*cut*)
Radial recurrent artery
Radial artery
Supinator muscle
Posterior and anterior interosseous arteries
Flexor digitorum superficialis muscle (radial head) (*cut*)
Pronator teres muscle (*cut and reflected*)
Radial artery
Flexor pollicis longus muscle and tendon (*cut*)
Radius
Pronator quadratus muscle
Brachioradialis tendon (*cut*)
Radial artery and superficial palmar branch
Flexor pollicis longus tendon (*cut*)
Flexor carpi radialis tendon (*cut*)
Abductor pollicis longus tendon
Extensor pollicis brevis tendon
1st metacarpal bone
Ulnar nerve
Median nerve
Brachial artery
Medial intermuscular septum
Pronator teres muscle (*superficial head cut and reflected*)
Anterior ulnar recurrent artery
Medial epicondyle of humerus
Flexor carpi radialis, palmaris longus, flexor digitorum superficialis (humeroulnar head), and flexor carpi ulnaris muscles (*cut*)
Posterior ulnar recurrent artery
Ulnar artery
Common interosseous artery
Pronator teres muscle (deep head) (*cut*)
Median nerve (*cut*)
Flexor digitorum profundus muscle
Anterior interosseous artery and nerve
Ulnar nerve and dorsal branch
Palmar carpal branches of radial and ulnar arteries
Flexor carpi ulnaris tendon (*cut*)
Pisiform bone
Deep palmar branch of ulnar artery and deep branch of ulnar nerve
Hook of hamate bone
5th metacarpal bone
F. Netter M.D.

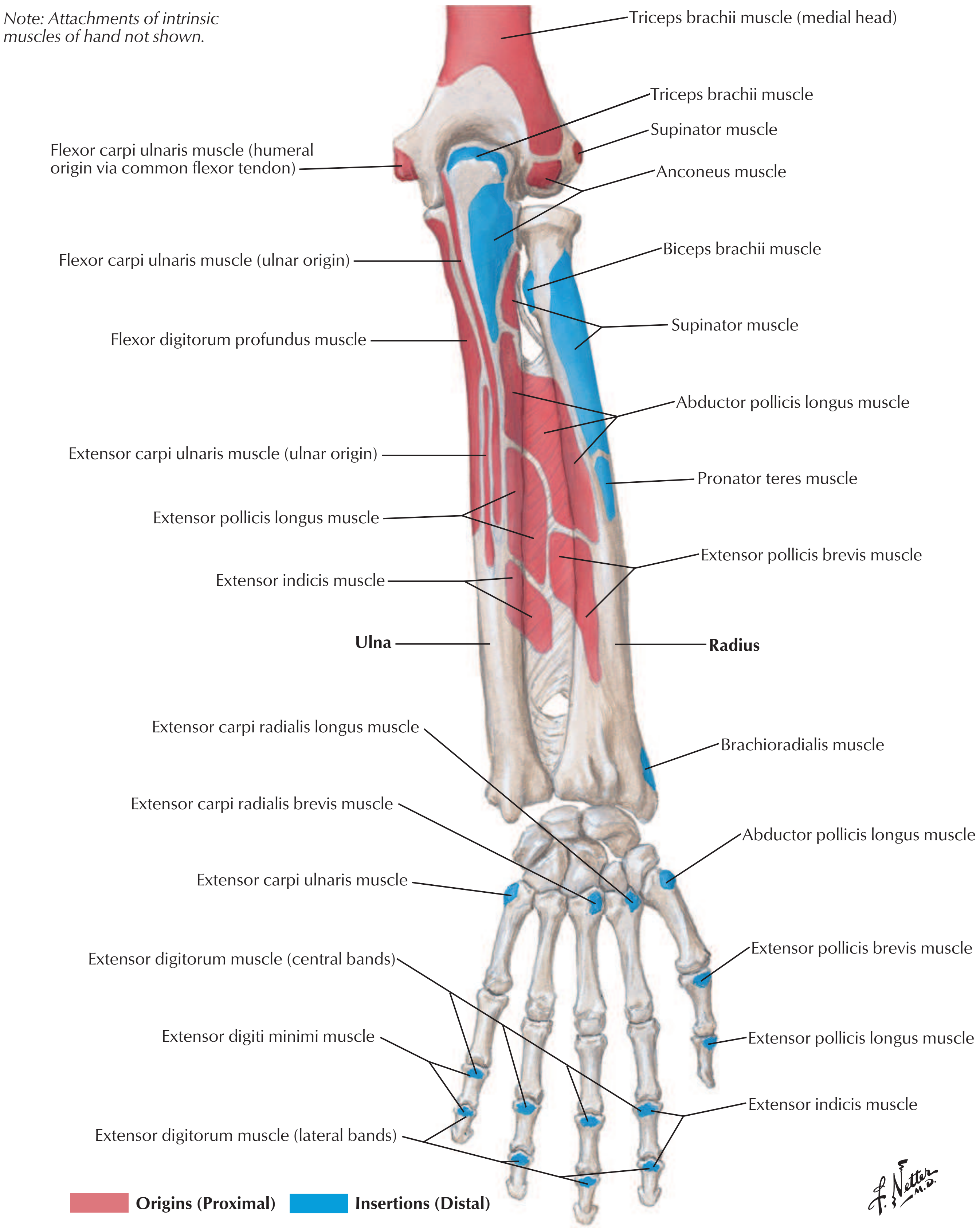
Attachments of Muscles of Forearm: Anterior View


Brachioradialis muscle
Brachialis muscle
Extensor carpi radialis longus muscle
Pronator teres muscle (superficial head)
Supinator muscle
Extensor carpi radialis brevis, extensor digitorum, extensor digiti minimi, extensor carpi ulnaris muscles
Common extensor tendon
Common flexor tendon
Pronator teres, flexor carpi radialis, palmaris longus, flexor carpi ulnaris, flexor digitorum superficialis (humeroulnar head) muscles
Brachialis muscle
Flexor digitorum superficialis muscle (humeroulnar head)
Biceps brachii muscle
Pronator teres muscle (deep head)
Supinator muscle
Flexor digitorum superficialis muscle (radial head)
Flexor digitorum profundus muscle
Pronator teres muscle
Flexor pollicis longus muscle
Ulna
Radius
Pronator quadratus muscle
Pronator quadratus muscle
Brachioradialis muscle
Abductor pollicis longus muscle
Flexor carpi ulnaris muscle
Extensor carpi ulnaris muscle
Flexor carpi radialis muscle
Flexor pollicis longus muscle
Flexor digitorum superficialis muscle
Flexor digitorum profundus muscle
🟥 Origins (Proximal)
🟦 Insertions (Distal)

Note: Attachments of intrinsic muscles of hand not shown.

Attachments of Muscles of Forearm: Posterior View

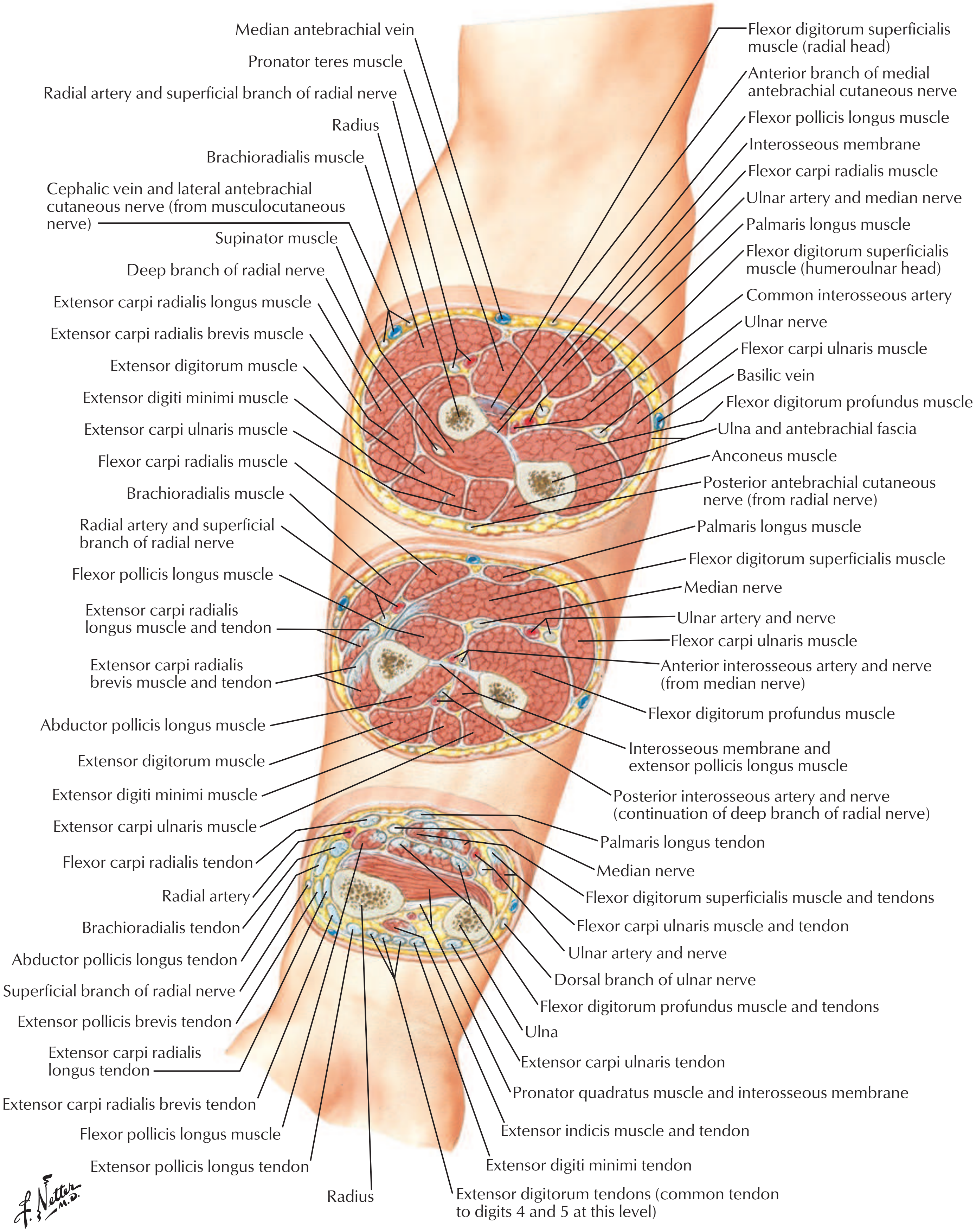
See also Plate 431



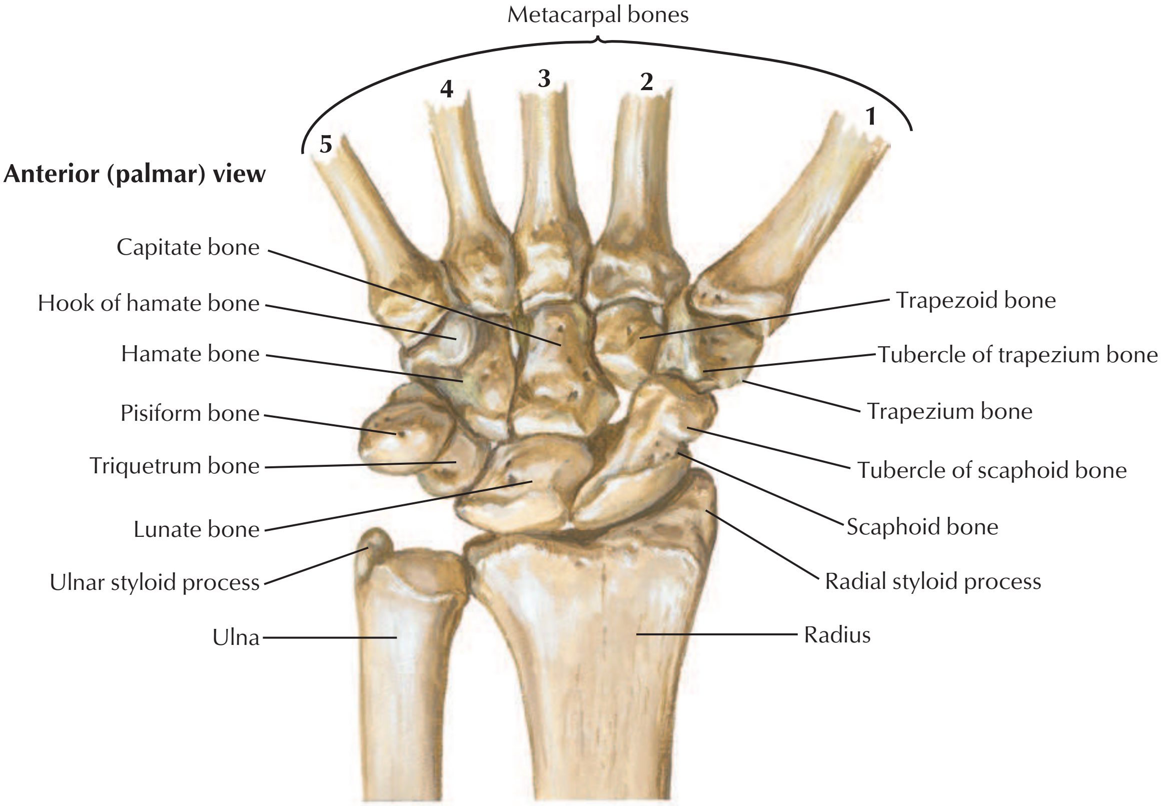
Note: Attachments of intrinsic muscles of hand not shown.

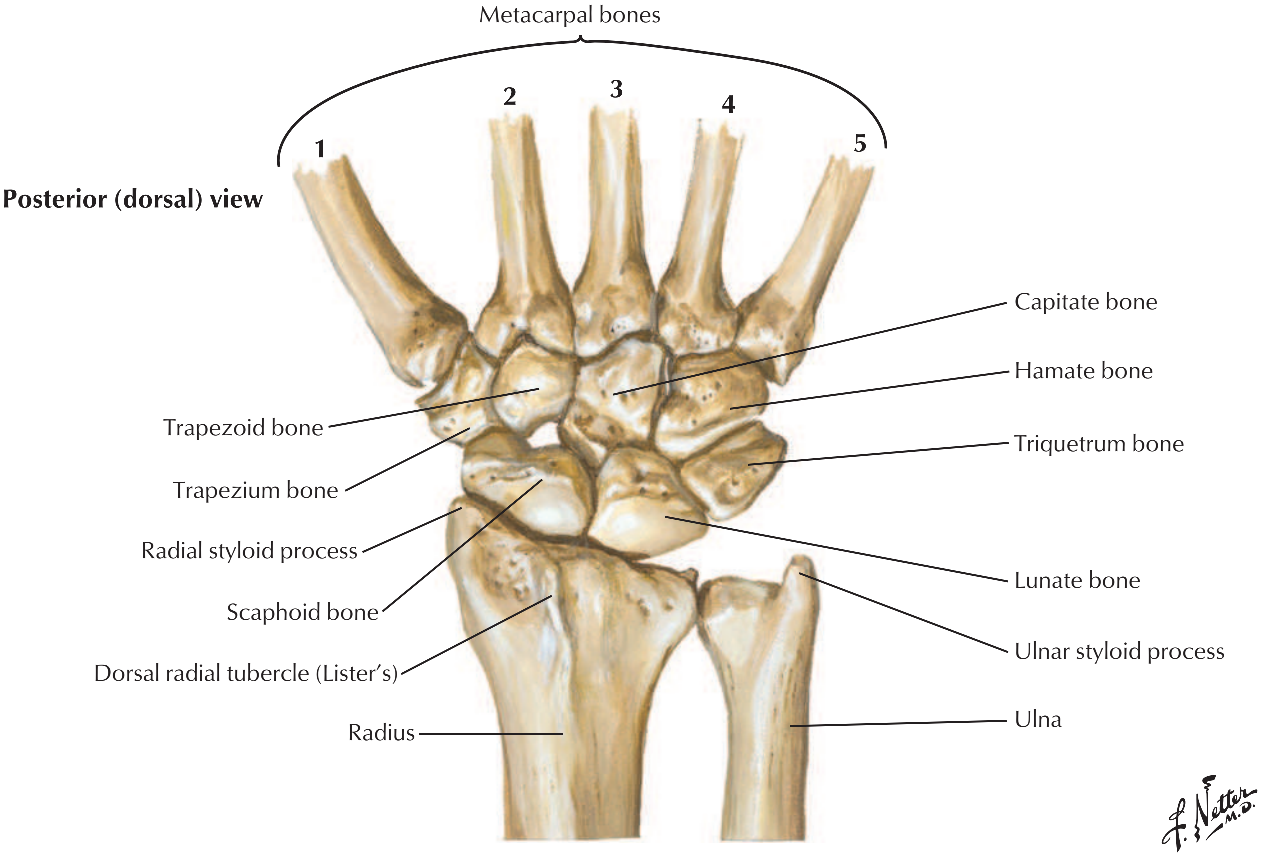
Triceps brachii muscle (medial head)
Triceps brachii muscle
Supinator muscle
Anconeus muscle
Flexor carpi ulnaris muscle (humeral origin via common flexor tendon)
Flexor carpi ulnaris muscle (ulnar origin)
Biceps brachii muscle
Supinator muscle
Flexor digitorum profundus muscle
Abductor pollicis longus muscle
Extensor carpi ulnaris muscle (ulnar origin)
Pronator teres muscle
Extensor pollicis longus muscle
Extensor pollicis brevis muscle
Extensor indicis muscle
Ulna
Radius
Extensor carpi radialis longus muscle
Brachioradialis muscle
Extensor carpi radialis brevis muscle
Abductor pollicis longus muscle
Extensor carpi ulnaris muscle
Extensor digitorum muscle (central bands)
Extensor pollicis brevis muscle
Extensor digiti minimi muscle
Extensor pollicis longus muscle
Extensor indicis muscle
Extensor digitorum muscle (lateral bands)
🟥 Origins (Proximal)
🟦 Insertions (Distal)

Forearm: Serial Cross Sections, Anterior View


Median antebrachial vein
Pronator teres muscle
Radial artery and superficial branch of radial nerve
Radius
Brachioradialis muscle
Cephalic vein and lateral antebrachial cutaneous nerve (from musculocutaneous nerve)
Supinator muscle
Deep branch of radial nerve
Extensor carpi radialis longus muscle
Extensor carpi radialis brevis muscle
Extensor digitorum muscle
Extensor digiti minimi muscle
Extensor carpi ulnaris muscle
Flexor carpi radialis muscle
Brachioradialis muscle
Radial artery and superficial branch of radial nerve
Flexor pollicis longus muscle
Extensor carpi radialis longus muscle and tendon
Extensor carpi radialis brevis muscle and tendon
Abductor pollicis longus muscle
Extensor digitorum muscle
Extensor digiti minimi muscle
Extensor carpi ulnaris muscle
Flexor carpi radialis tendon
Radial artery
Brachioradialis tendon
Abductor pollicis longus tendon
Superficial branch of radial nerve
Extensor pollicis brevis tendon
Extensor carpi radialis longus tendon
Extensor carpi radialis brevis tendon
Flexor pollicis longus muscle
Extensor pollicis longus tendon
Radius
Flexor digitorum superficialis muscle (radial head)
Anterior branch of medial antebrachial cutaneous nerve
Flexor pollicis longus muscle
Interosseous membrane
Flexor carpi radialis muscle
Ulnar artery and median nerve
Palmaris longus muscle
Flexor digitorum superficialis muscle (humeroulnar head)
Common interosseous artery
Ulnar nerve
Flexor carpi ulnaris muscle
Basilic vein
Flexor digitorum profundus muscle
Ulna and antebrachial fascia
Anconeus muscle
Posterior antebrachial cutaneous nerve (from radial nerve)
Palmaris longus muscle
Flexor digitorum superficialis muscle
Median nerve
Ulnar artery and nerve
Flexor carpi ulnaris muscle
Anterior interosseous artery and nerve (from median nerve)
Flexor digitorum profundus muscle
Interosseous membrane and extensor pollicis longus muscle
Posterior interosseous artery and nerve (continuation of deep branch of radial nerve)
Palmaris longus tendon
Median nerve
Flexor digitorum superficialis muscle and tendons
Flexor carpi ulnaris muscle and tendon
Ulnar artery and nerve
Dorsal branch of ulnar nerve
Flexor digitorum profundus muscle and tendons
Ulna
Extensor carpi ulnaris tendon
Pronator quadratus muscle and interosseous membrane
Extensor indicis muscle and tendon
Extensor digiti minimi tendon
Extensor digitorum tendons (common tendon to digits 4 and 5 at this level)

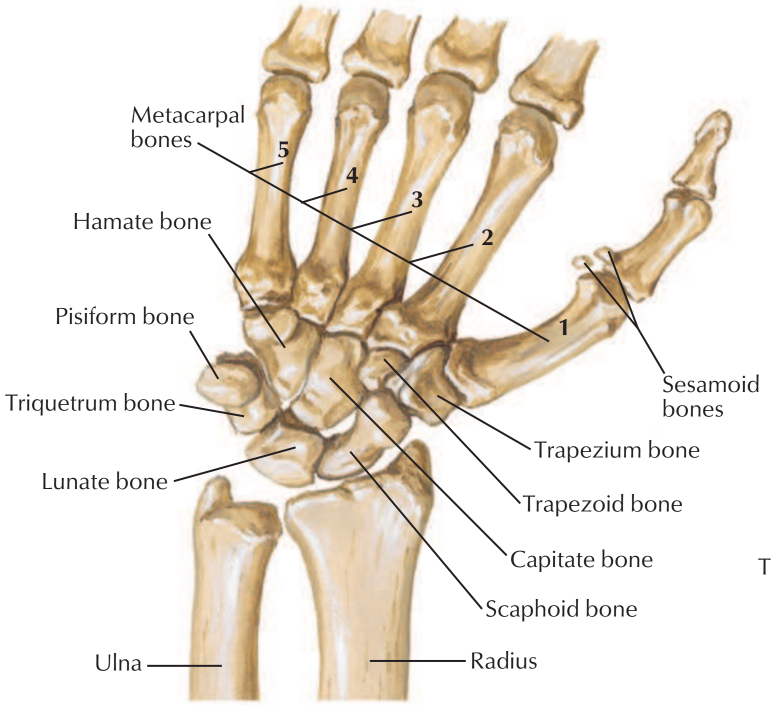
See also Plate 447


Metacarpal bones
5
4
3
2
1
Anterior (palmar) view
Capitate bone
Hook of hamate bone
Hamate bone
Pisiform bone
Triquetrum bone
Lunate bone
Ulnar styloid process
Ulna
Trapezoid bone
Tubercle of trapezium bone
Trapezium bone
Tubercle of scaphoid bone
Scaphoid bone
Radial styloid process
Radius

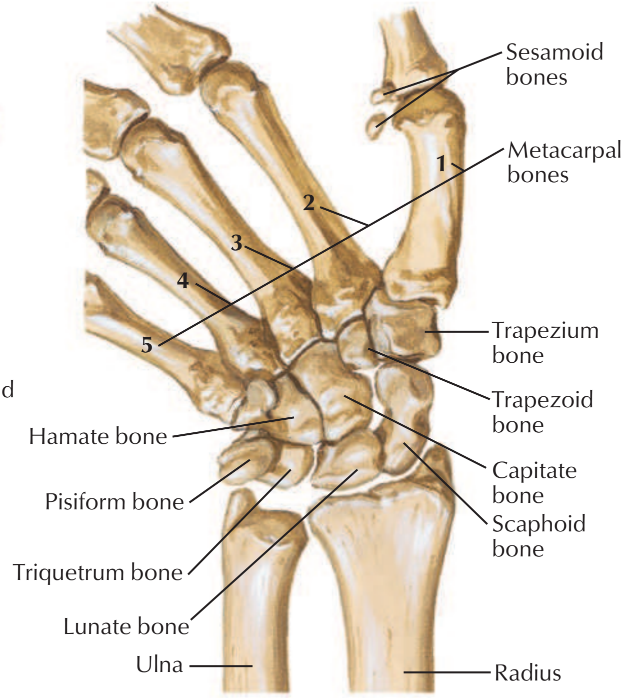

Metacarpal bones
1
2
3
4
5
Posterior (dorsal) view
Trapezoid bone
Trapezium bone
Radial styloid process
Scaphoid bone
Dorsal radial tubercle (Lister's)
Radius
Capitate bone
Hamate bone
Triquetrum bone
Lunate bone
Ulnar styloid process
Ulna
F. Netter M.D.

Movements of Wrist

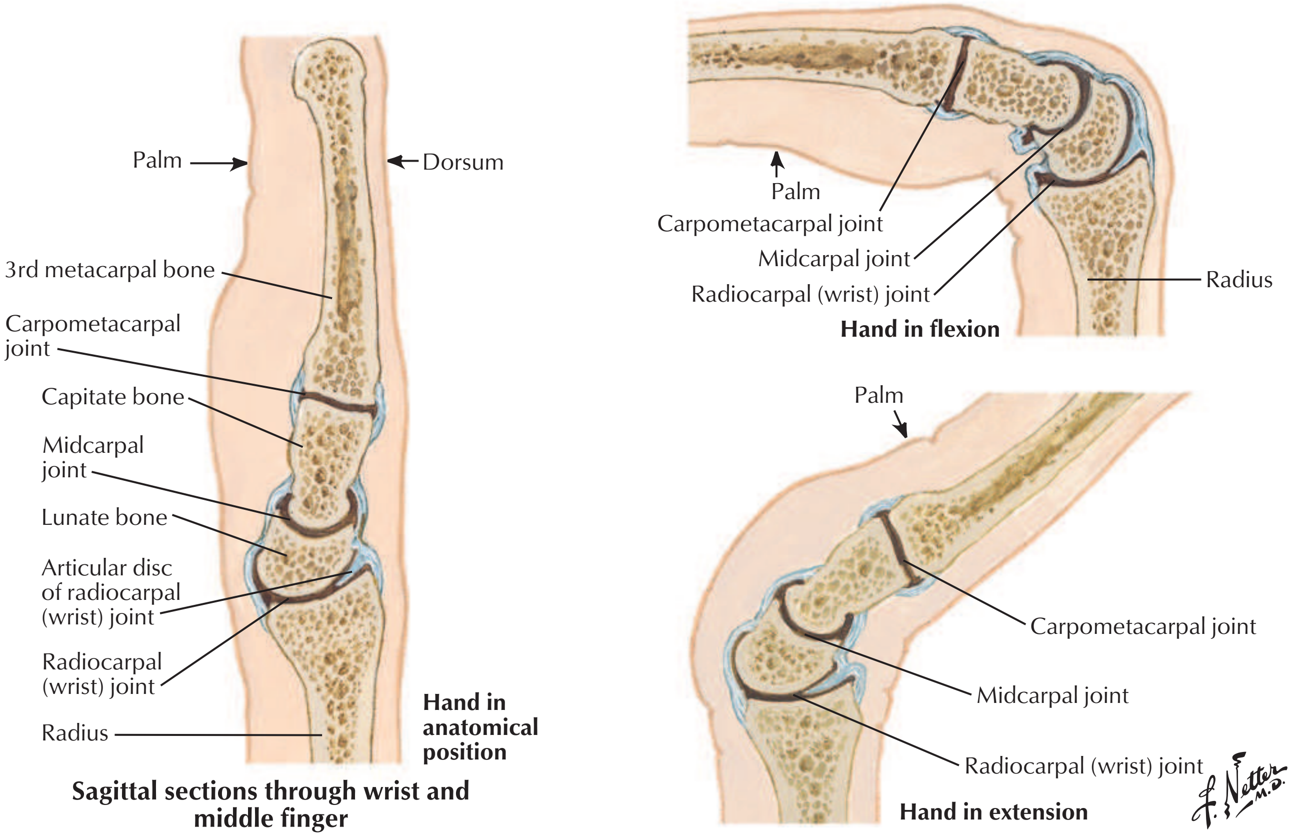
See also Plates 446, 447


Metacarpal bones
5
4
3
2
1
Hamate bone
Pisiform bone
Triquetrum bone
Lunate bone
Sesamoid bones
Trapezium bone
Trapezoid bone
Capitate bone
Scaphoid bone
Ulna
Radius

Position of carpal bones with hand in abduction: anterior (palmar) view

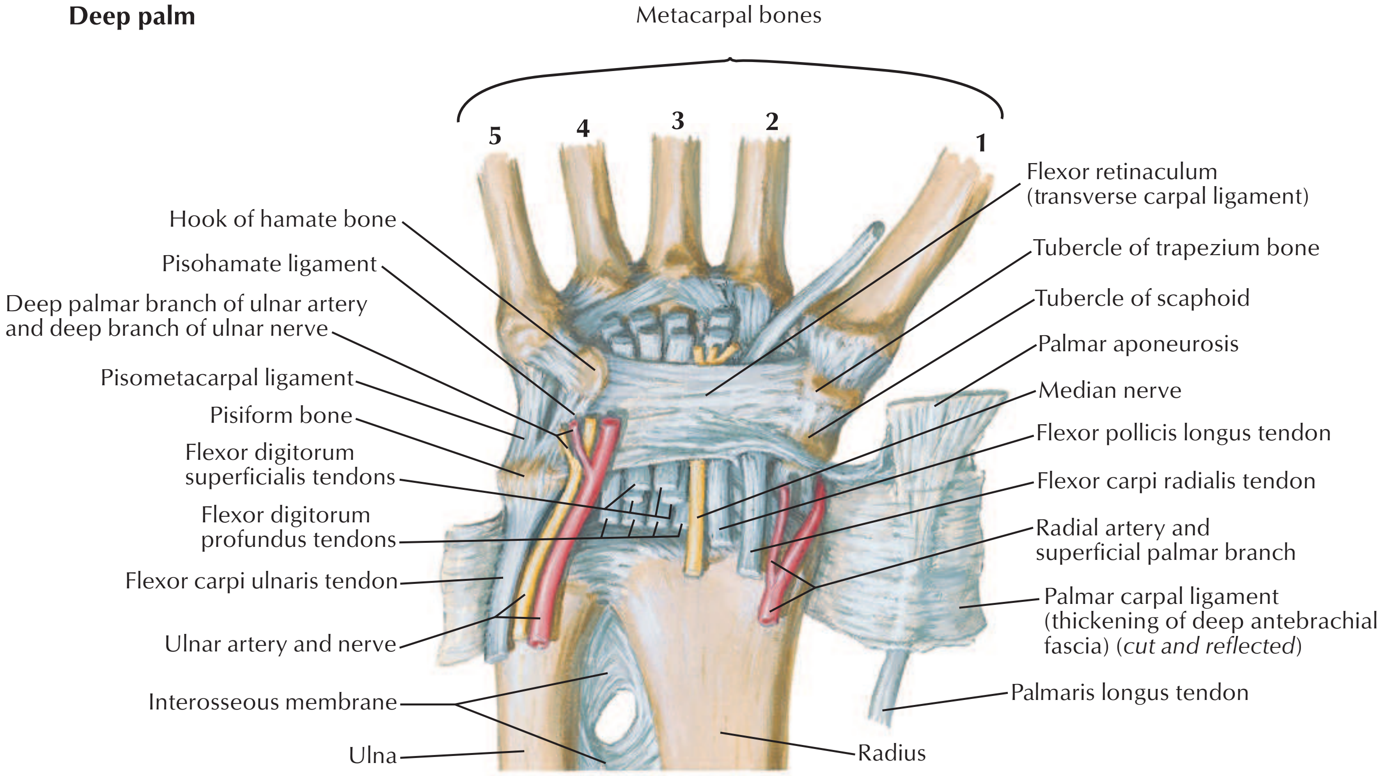

Sesamoid bones
Metacarpal bones
1
2
3
4
5
Trapezium bone
Trapezoid bone
Hamate bone
Capitate bone
Scaphoid bone
Pisiform bone
Triquetrum bone
Lunate bone
Ulna
Radius

Position of carpal bones with hand in adduction: anterior (palmar) view

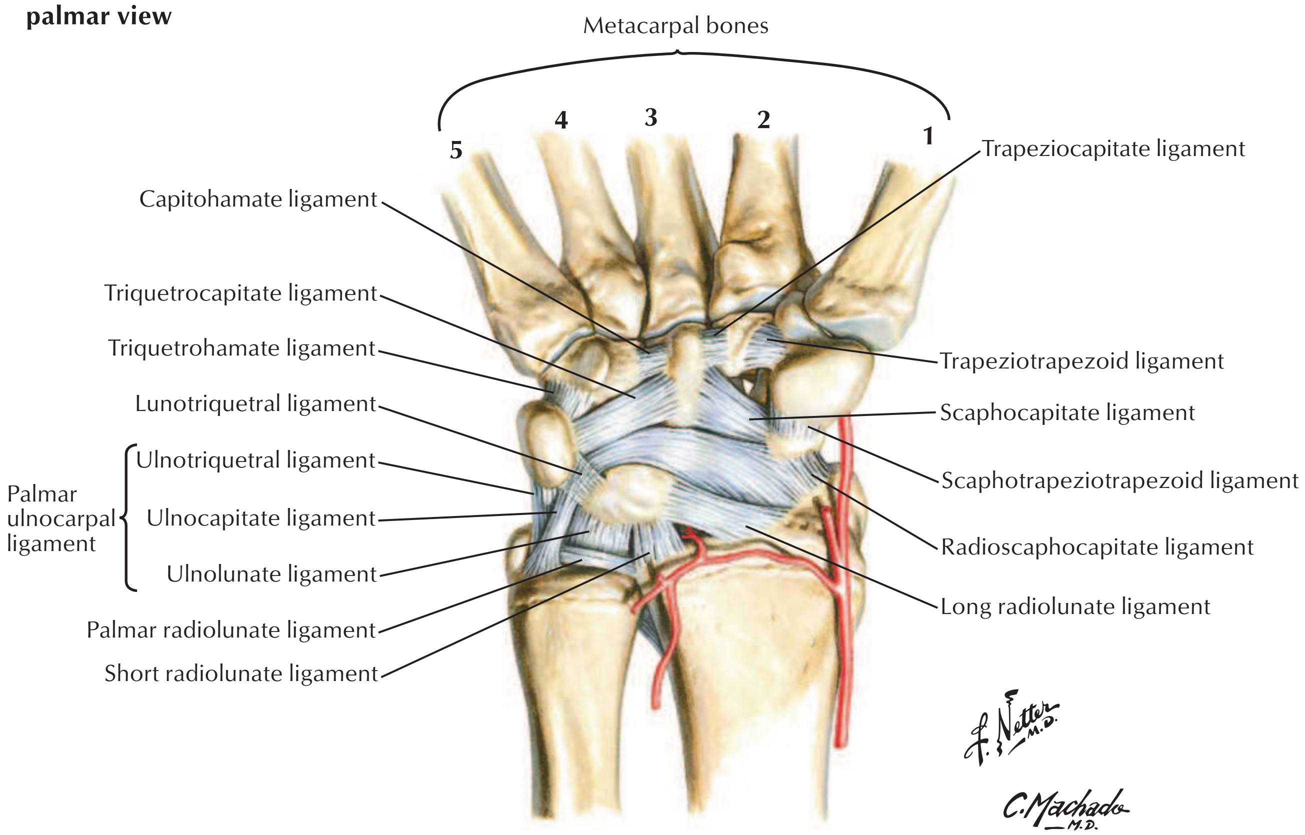

Palm
Dorsum
3rd metacarpal bone
Carpometacarpal joint
Capitate bone
Midcarpal joint
Lunate bone
Articular disc of radiocarpal (wrist) joint
Radiocarpal (wrist) joint
Radius
Hand in anatomical position
Palm
Carpometacarpal joint
Midcarpal joint
Radiocarpal (wrist) joint
Radius
Hand in flexion
Palm
Carpometacarpal joint
Midcarpal joint
Radiocarpal (wrist) joint
Hand in extension

Sagittal sections through wrist and middle finger

Deep palm

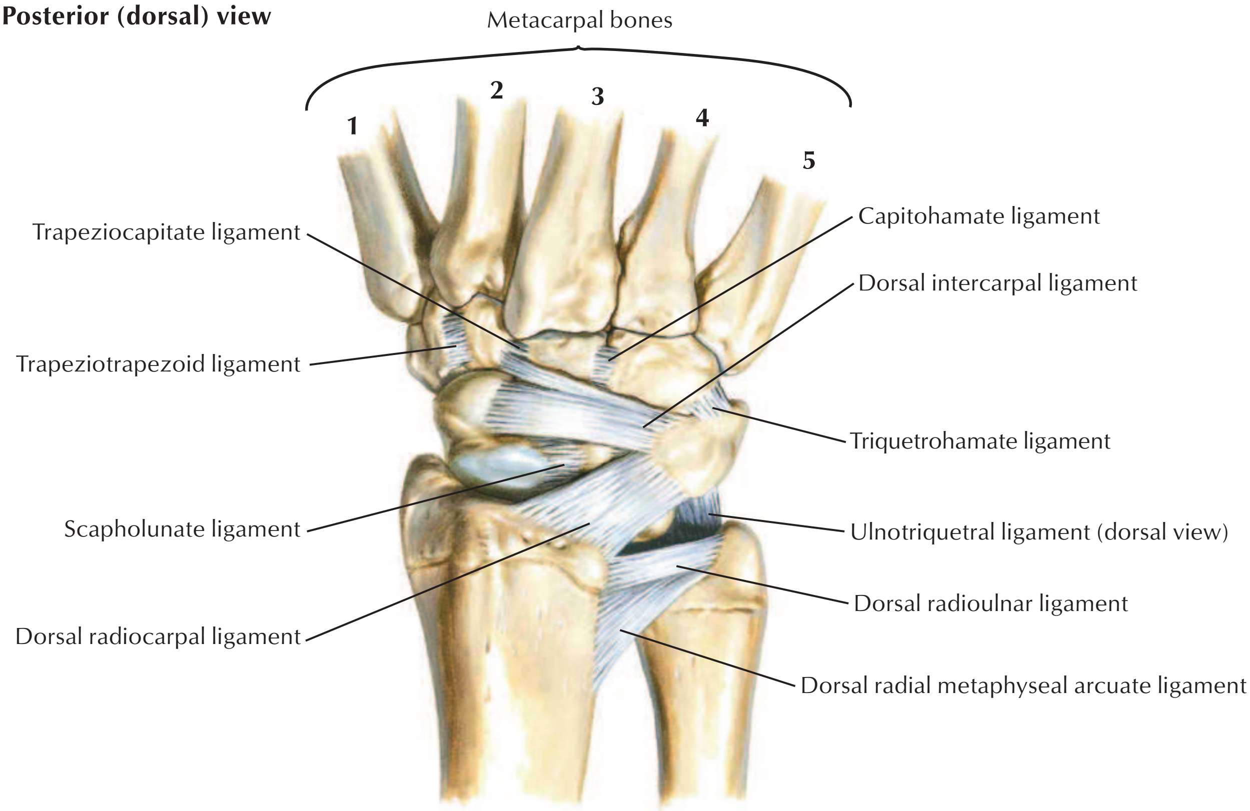

Metacarpal bones
5
4
3
2
1
Hook of hamate bone
Pisohamate ligament
Deep palmar branch of ulnar artery and deep branch of ulnar nerve
Pisometacarpal ligament
Pisiform bone
Flexor digitorum superficialis tendons
Flexor digitorum profundus tendons
Flexor carpi ulnaris tendon
Ulnar artery and nerve
Interosseous membrane
Ulna
Flexor retinaculum (transverse carpal ligament)
Tubercle of trapezium bone
Tubercle of scaphoid
Palmar aponeurosis
Median nerve
Flexor pollicis longus tendon
Flexor carpi radialis tendon
Radial artery and superficial palmar branch
Palmar carpal ligament (thickening of deep antebrachial fascia) (*cut and reflected*)
Palmaris longus tendon
Radius

Flexor retinaculum removed: palmar view

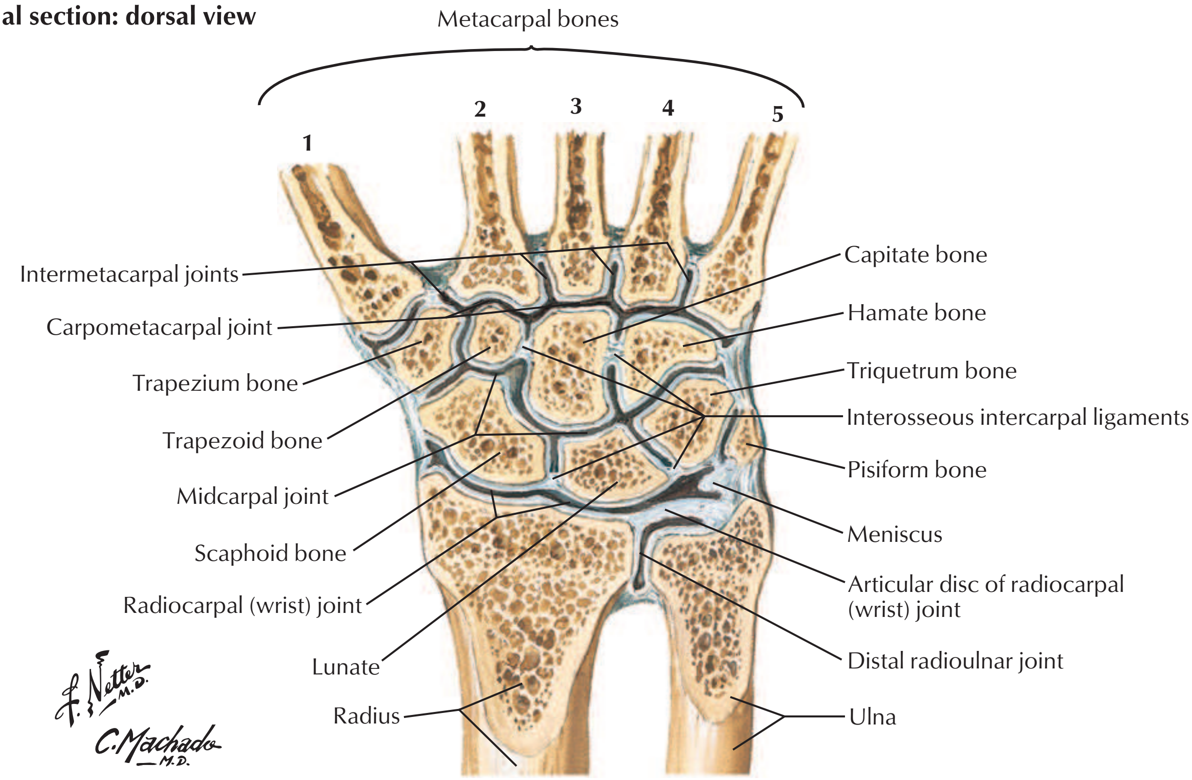

Metacarpal bones
5
4
3
2
1
Capitohamate ligament
Triquetrocapitate ligament
Triquetrohamate ligament
Lunotriquetral ligament
Palmar ulnocarpal ligament
Ulnotriquetral ligament
Ulnocapitate ligament
Ulnolunate ligament
Palmar radiolunate ligament
Short radiolunate ligament
Trapeziocapitate ligament
Trapeziotrapezoid ligament
Scaphocapitate ligament
Scaphotrapeziotrapezoid ligament
Radioscaphocapitate ligament
Long radiolunate ligament
F. Netter M.D.
C. Machado M.D.

See also Plate 447

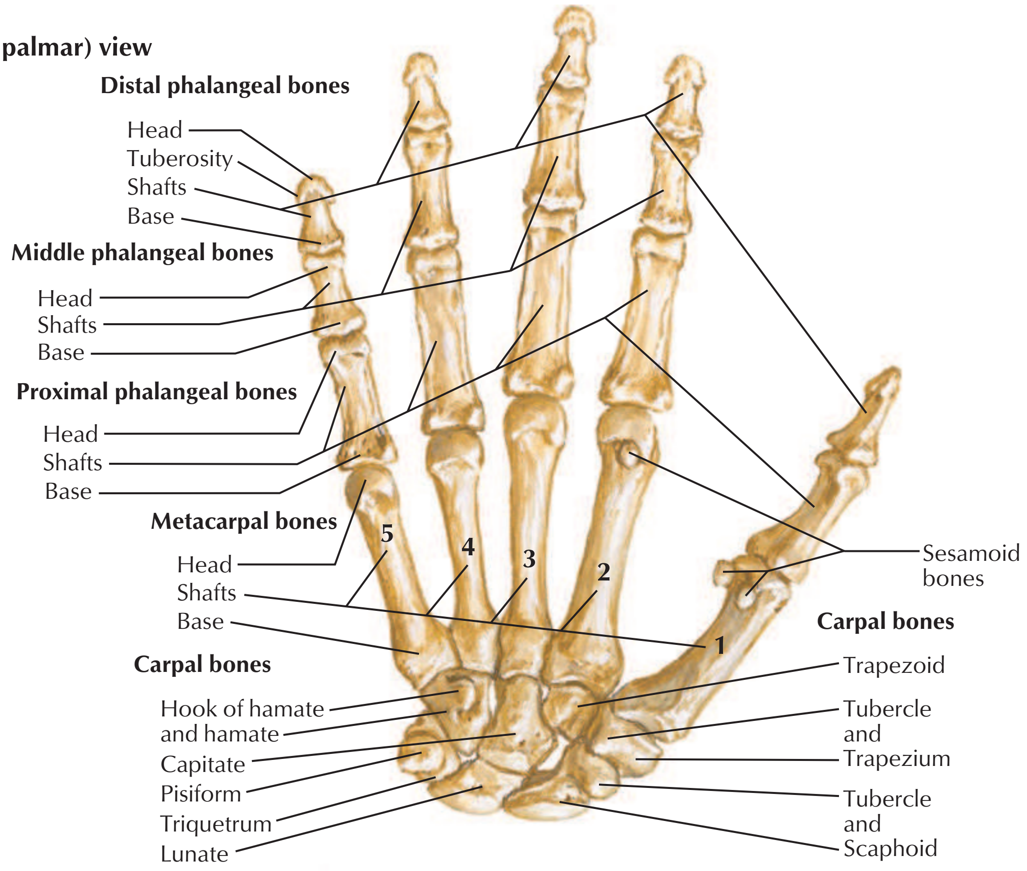
Posterior (dorsal) view


Metacarpal bones
1
2
3
4
5
Trapeziocapitate ligament
Trapeziotrapezoid ligament
Scapholunate ligament
Dorsal radiocarpal ligament
Capitohamate ligament
Dorsal intercarpal ligament
Triquetrohamate ligament
Ulnotriquetral ligament (dorsal view)
Dorsal radioulnar ligament
Dorsal radial metaphyseal arcuate ligament

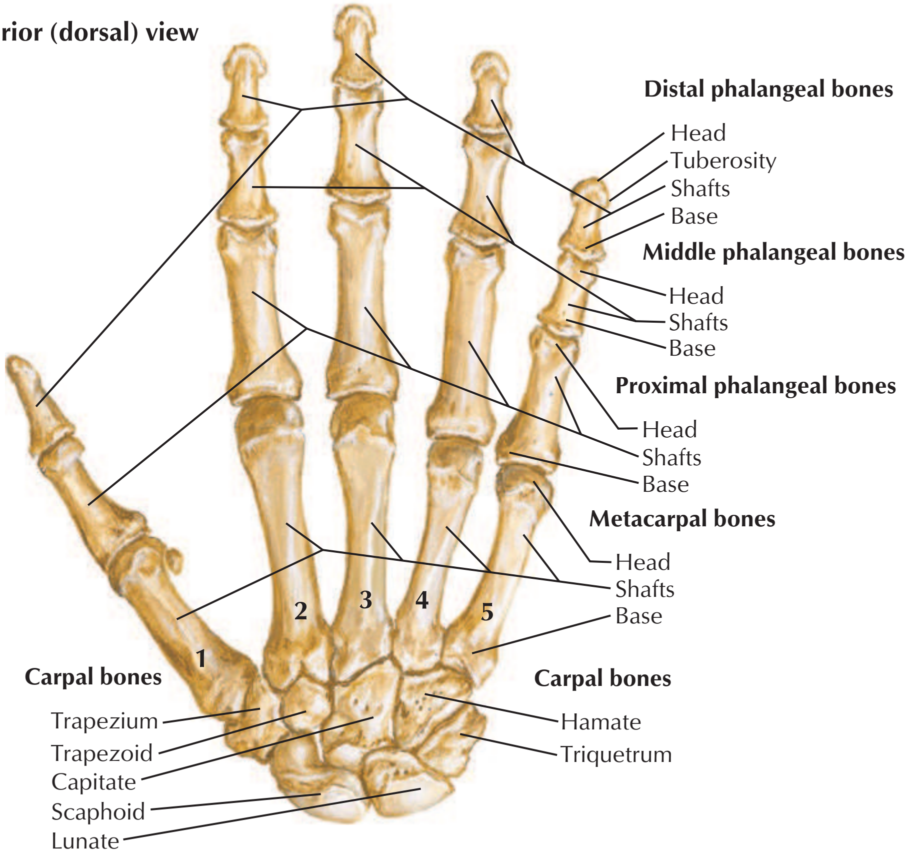
Coronal section: dorsal view


Metacarpal bones
1
2
3
4
5
Intermetacarpal joints
Carpometacarpal joint
Trapezium bone
Trapezoid bone
Midcarpal joint
Scaphoid bone
Radiocarpal (wrist) joint
Lunate
Radius
Capitate bone
Hamate bone
Triquetrum bone
Interosseous intercarpal ligaments
Pisiform bone
Meniscus
Articular disc of radiocarpal (wrist) joint
Distal radioulnar joint
Ulna
F. Netter M.D.
C. Machado M.D.

Right hand: anterior (palmar) view


Distal phalangeal bones
Head
Tuberosity
Shafts
Base
Middle phalangeal bones
Head
Shafts
Base
Proximal phalangeal bones
Head
Shafts
Base
Metacarpal bones
Head
Shafts
Base
5
4
3
2
1
Sesamoid bones
Carpal bones
Hook of hamate and hamate
Capitate
Pisiform
Triquetrum
Lunate
Carpal bones
Trapezoid
Tubercle and Trapezium
Tubercle and Scaphoid

Right hand: posterior (dorsal) view


Distal phalangeal bones
Head
Tuberosity
Shafts
Base
Middle phalangeal bones
Head
Shafts
Base
Proximal phalangeal bones
Head
Shafts
Base
Metacarpal bones
Head
Shafts
Base
2
3
4
5
1
Carpal bones
Trapezium
Trapezoid
Capitate
Scaphoid
Lunate
Carpal bones
Hamate
Triquetrum

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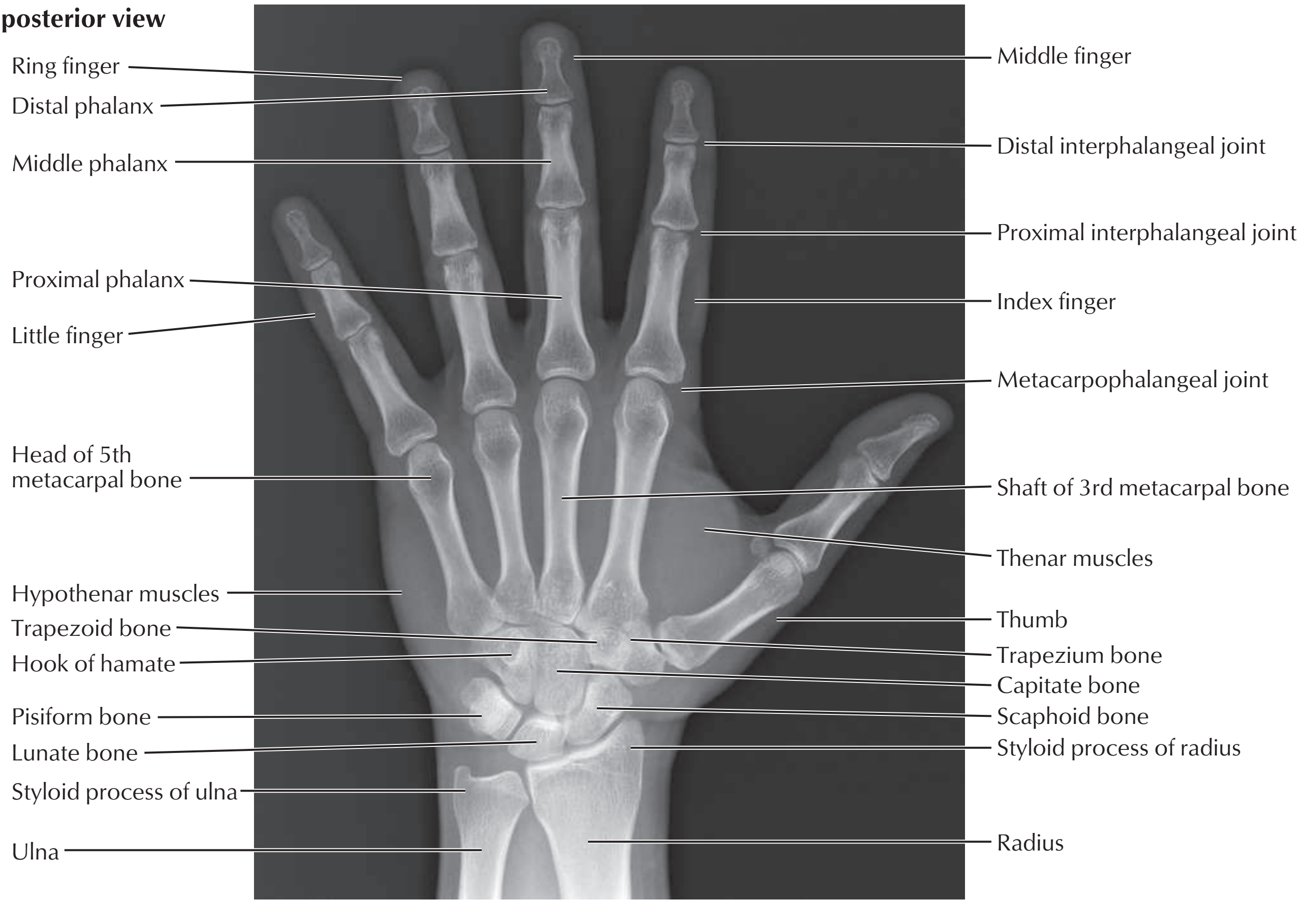
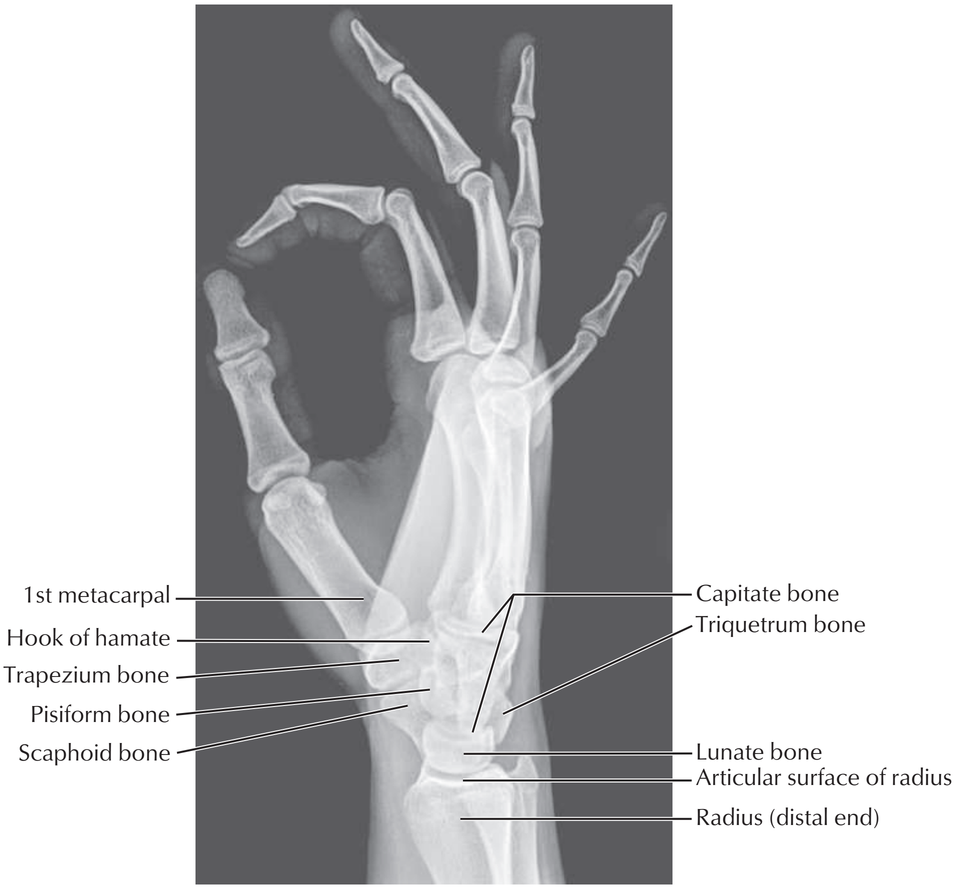
Wrist and Hand: Radiographs

See also Plate 446

Anteroposterior view

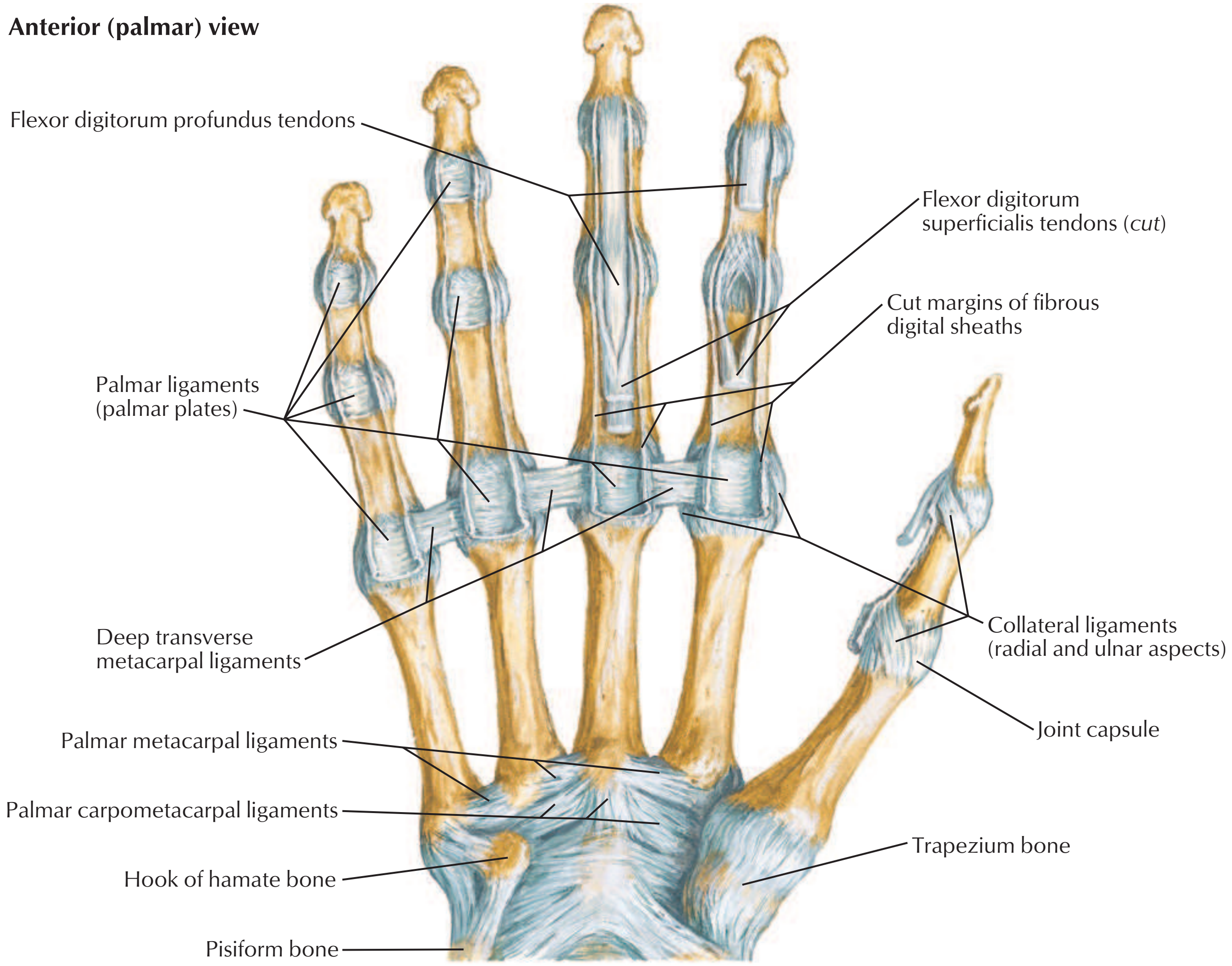

Ring finger
Distal phalanx
Middle phalanx
Proximal phalanx
Little finger
Head of 5th metacarpal bone
Hypothenar muscles
Trapezoid bone
Hook of hamate
Pisiform bone
Lunate bone
Styloid process of ulna
Ulna
Middle finger
Distal interphalangeal joint
Proximal interphalangeal joint
Index finger
Metacarpophalangeal joint
Shaft of 3rd metacarpal bone
Thenar muscles
Thumb
Trapezium bone
Capitate bone
Scaphoid bone
Styloid process of radius
Radius

Lateral view

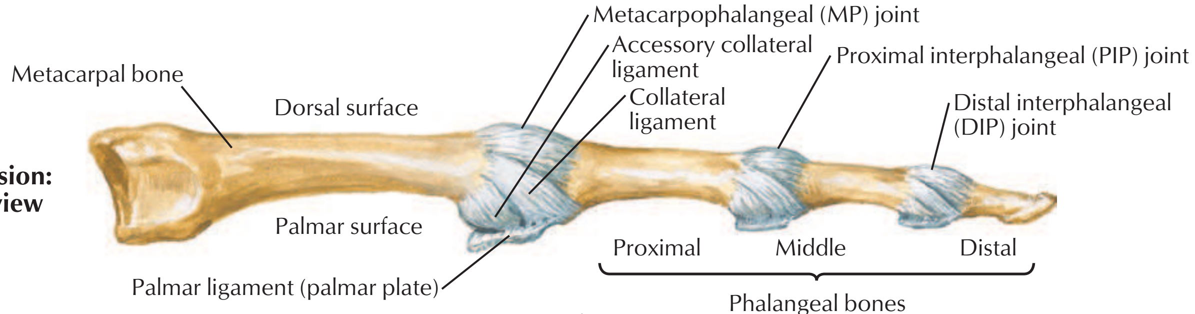

1st metacarpal
Hook of hamate
Trapezium bone
Pisiform bone
Scaphoid bone
Capitate bone
Triquetrum bone
Lunate bone
Articular surface of radius
Radius (distal end)

See also Plate 451

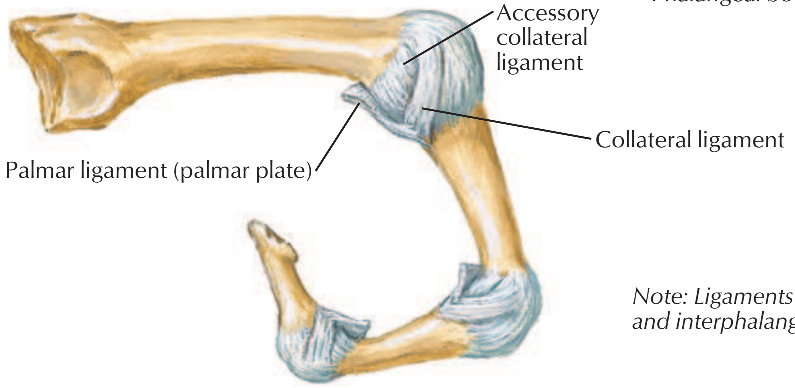
Anterior (palmar) view


Flexor digitorum profundus tendons
Flexor digitorum superficialis tendons (*cut*)
Cut margins of fibrous digital sheaths
Palmar ligaments (palmar plates)
Collateral ligaments (radial and ulnar aspects)
Deep transverse metacarpal ligaments
Joint capsule
Palmar metacarpal ligaments
Palmar carpometacarpal ligaments
Trapezium bone
Hook of hamate bone
Pisiform bone

In extension: medial view


Metacarpophalangeal (MP) joint
Accessory collateral ligament
Proximal interphalangeal (PIP) joint
Metacarpal bone
Collateral ligament
Distal interphalangeal (DIP) joint
Dorsal surface
Palmar surface
Proximal
Middle
Distal
Phalangeal bones
Palmar ligament (palmar plate)

In flexion: medial view


Accessory collateral ligament
Palmar ligament (palmar plate)
Collateral ligament

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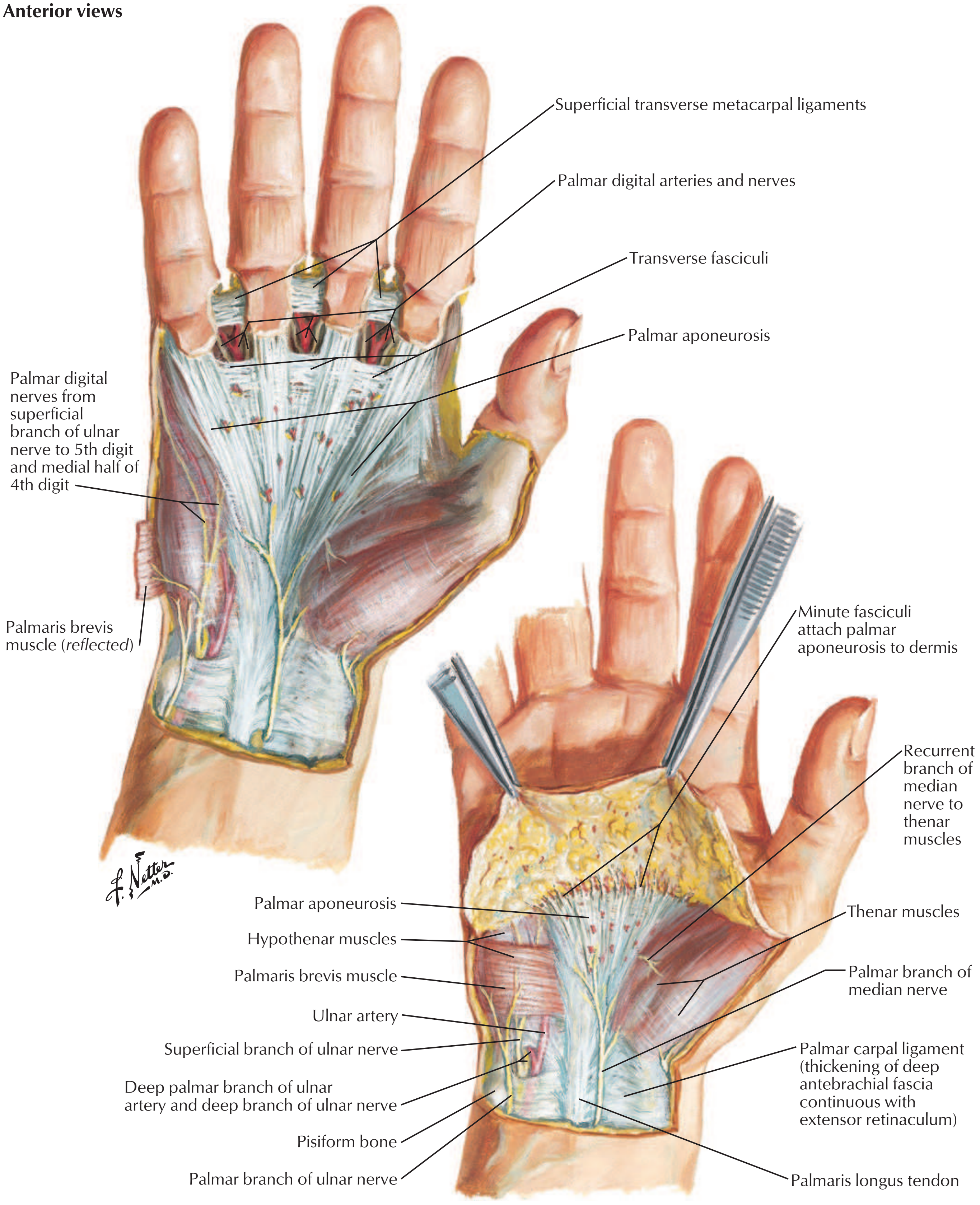
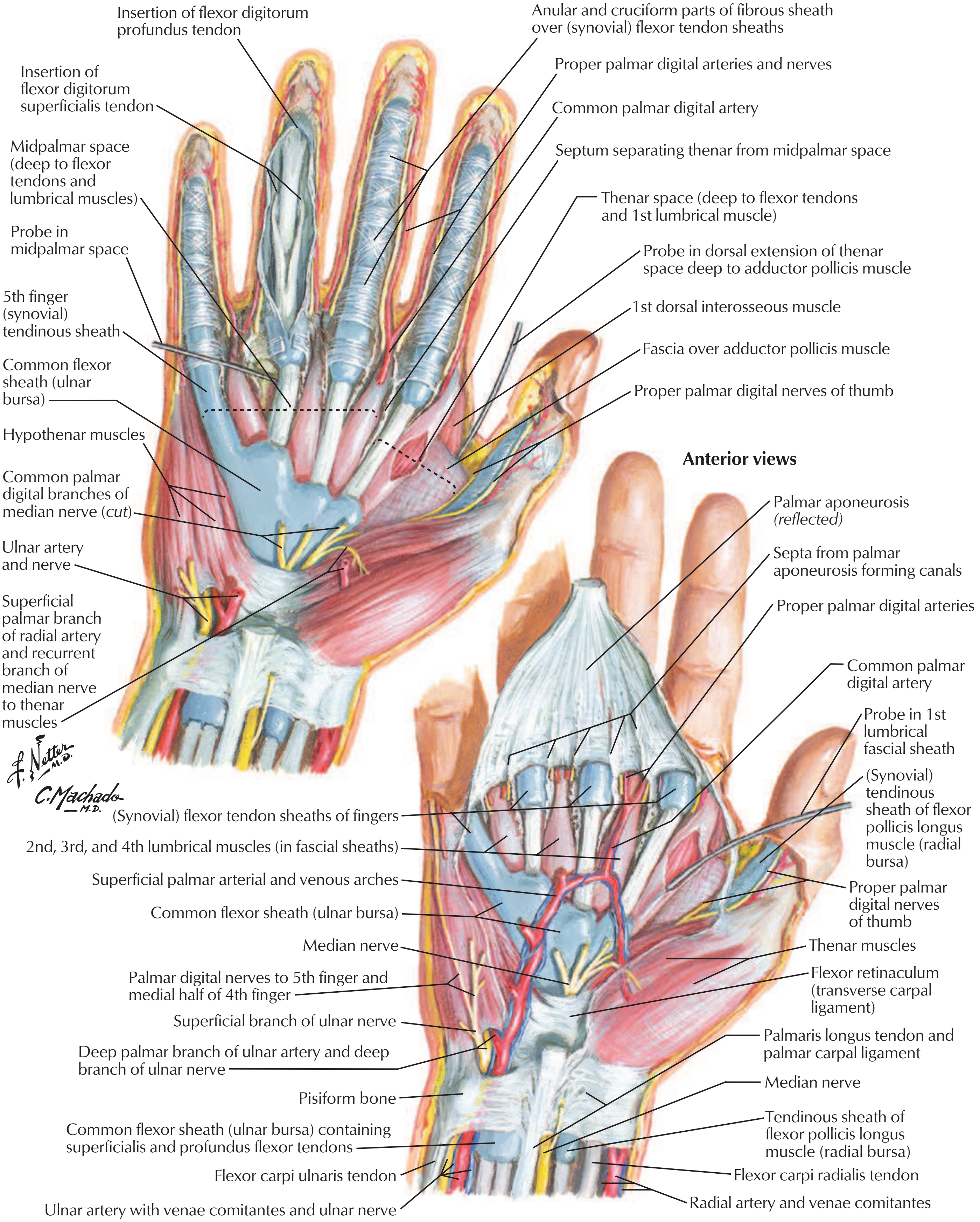
Note: Ligaments of metacarpophalangeal and interphalangeal joints are similar.

Wrist and Hand: Superficial Palmar Dissections

See also Plate 462

Anterior views

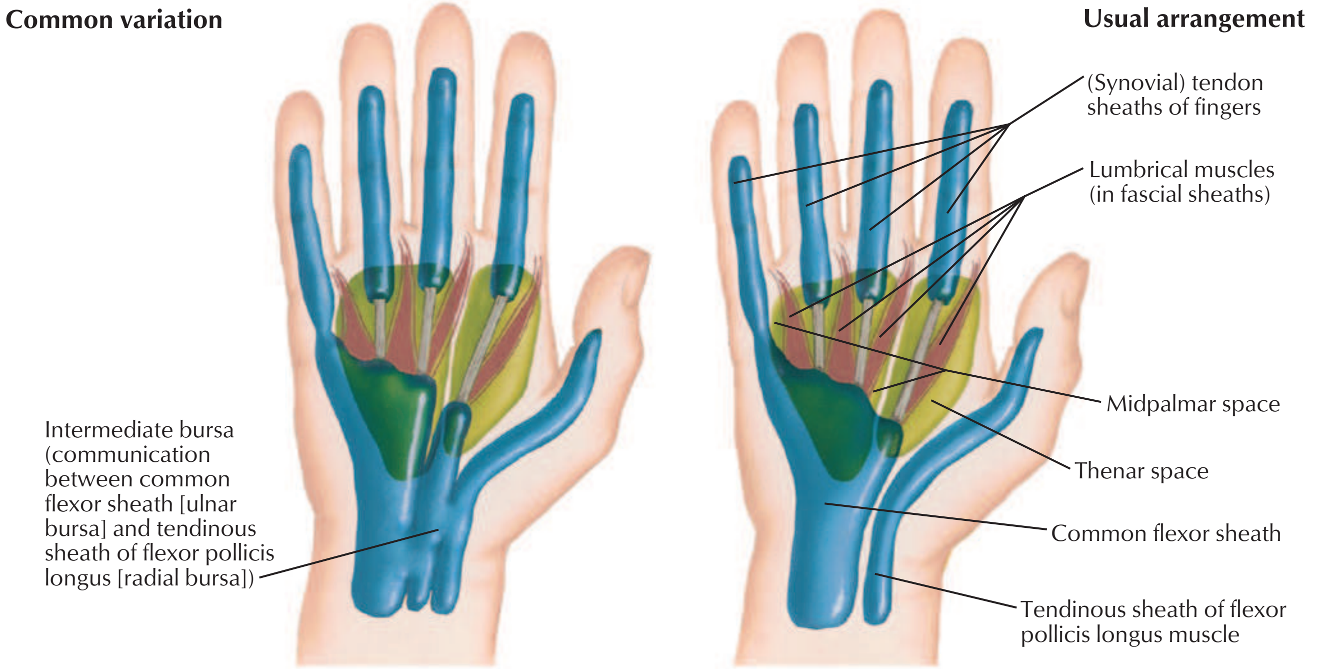

Superficial transverse metacarpal ligaments
Palmar digital arteries and nerves
Transverse fasciculi
Palmar aponeurosis
Palmar digital nerves from superficial branch of ulnar nerve to 5th digit and medial half of 4th digit
Palmaris brevis muscle (*reflected*)
Minute fasciculi attach palmar aponeurosis to dermis
Recurrent branch of median nerve to thenar muscles
Palmar aponeurosis
Hypothenar muscles
Palmaris brevis muscle
Ulnar artery
Superficial branch of ulnar nerve
Deep palmar branch of ulnar artery and deep branch of ulnar nerve
Pisiform bone
Palmar branch of ulnar nerve
Thenar muscles
Palmar branch of median nerve
Palmar carpal ligament (thickening of deep antebrachial fascia continuous with extensor retinaculum)
Palmaris longus tendon


Insertion of flexor digitorum profundus tendon
Insertion of flexor digitorum superficialis tendon
Midpalmar space (deep to flexor tendons and lumbrical muscles)
Probe in midpalmar space
5th finger (synovial) tendinous sheath
Common flexor sheath (ulnar bursa)
Hypothenar muscles
Common palmar digital branches of median nerve (*cut*)
Ulnar artery and nerve
Superficial palmar branch of radial artery and recurrent branch of median nerve to thenar muscles
Anular and cruciform parts of fibrous sheath over (synovial) flexor tendon sheaths
Proper palmar digital arteries and nerves
Common palmar digital artery
Septum separating thenar from midpalmar space
Thenar space (deep to flexor tendons and 1st lumbrical muscle)
Probe in dorsal extension of thenar space deep to adductor pollicis muscle
1st dorsal interosseous muscle
Fascia over adductor pollicis muscle
Proper palmar digital nerves of thumb
F. Netter M.D.
C. Machado M.D.
Palmar aponeurosis *(reflected)*
Septa from palmar aponeurosis forming canals
Proper palmar digital arteries
Common palmar digital artery
Probe in 1st lumbrical fascial sheath
(Synovial) tendinous sheath of flexor pollicis longus muscle (radial bursa)
Proper palmar digital nerves of thumb
Thenar muscles
Flexor retinaculum (transverse carpal ligament)
Palmaris longus tendon and palmar carpal ligament
Median nerve
Tendinous sheath of flexor pollicis longus muscle (radial bursa)
Flexor carpi radialis tendon
Radial artery and venae comitantes
(Synovial) flexor tendon sheaths of fingers
2nd, 3rd, and 4th lumbrical muscles (in fascial sheaths)
Superficial palmar arterial and venous arches
Common flexor sheath (ulnar bursa)
Median nerve
Palmar digital nerves to 5th finger and medial half of 4th finger
Superficial branch of ulnar nerve
Deep palmar branch of ulnar artery and deep branch of ulnar nerve
Pisiform bone
Common flexor sheath (ulnar bursa) containing superficialis and profundus flexor tendons
Flexor carpi ulnaris tendon
Ulnar artery with venae comitantes and ulnar nerve

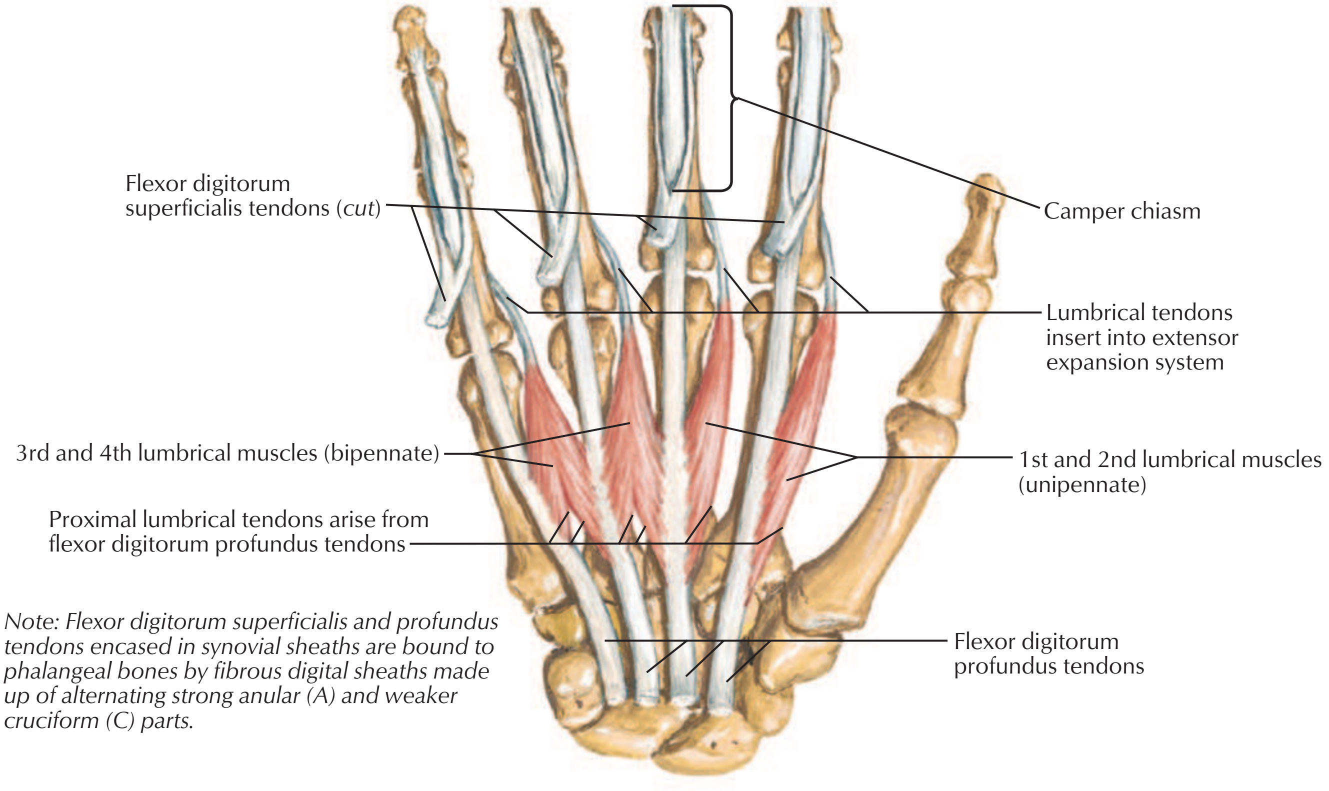
Anterior views

Lumbrical Muscles and Bursae, Spaces, and Sheaths: Schema

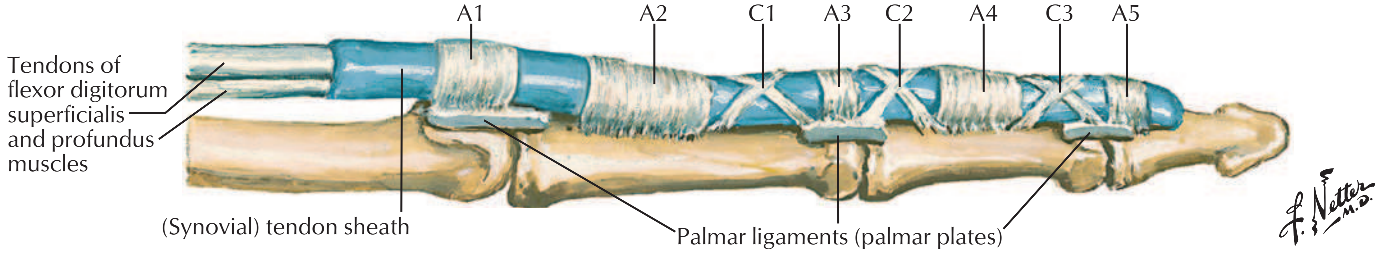
See also **Plate 448**


Common variation
Usual arrangement
(Synovial) tendon sheaths of fingers
Lumbrical muscles (in fascial sheaths)
Midpalmar space
Thenar space
Common flexor sheath
Tendinous sheath of flexor pollicis longus muscle
Intermediate bursa (communication between common flexor sheath [ulnar bursa] and tendinous sheath of flexor pollicis longus [radial bursa])

Lumbrical muscles: schema

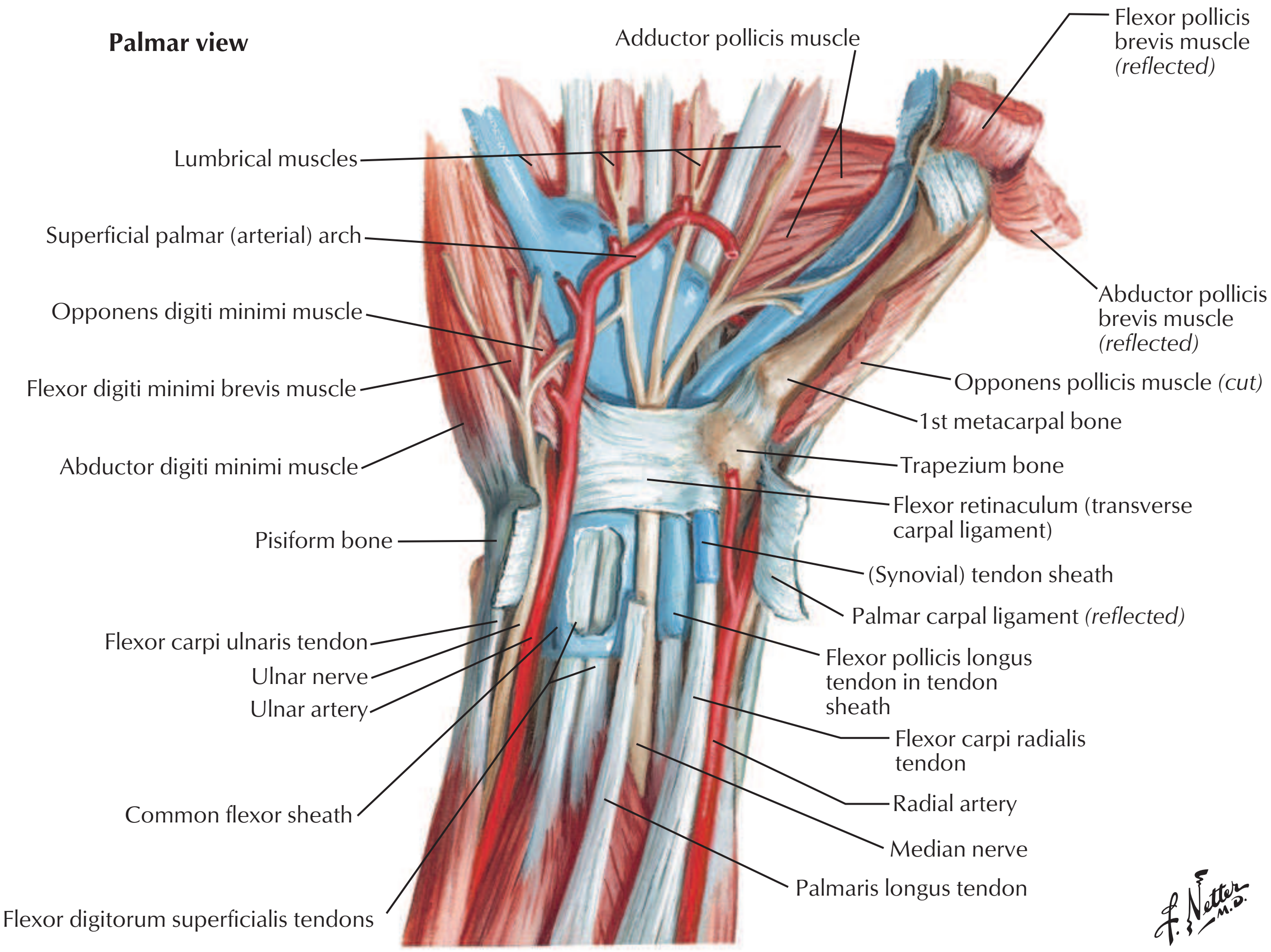

Flexor digitorum superficialis tendons (*cut*)
Camper chiasm
Lumbrical tendons insert into extensor expansion system
3rd and 4th lumbrical muscles (bipennate)
1st and 2nd lumbrical muscles (unipennate)
Proximal lumbrical tendons arise from flexor digitorum profundus tendons
Flexor digitorum profundus tendons

Note: Flexor digitorum superficialis and profundus tendons encased in synovial sheaths are bound to phalangeal bones by fibrous digital sheaths made up of alternating strong anular (A) and weaker cruciform (C) parts.

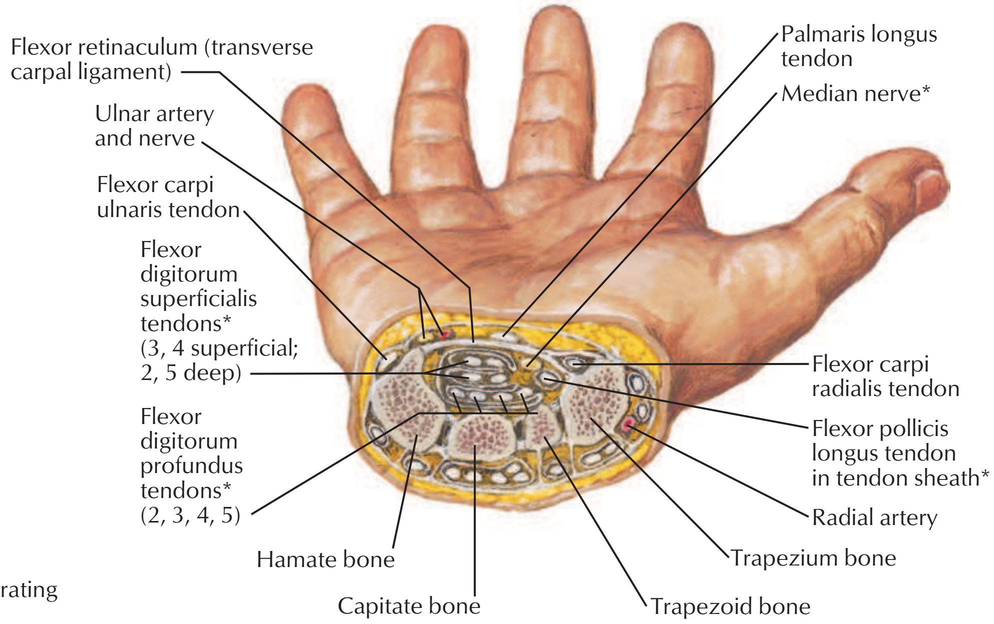

A1
A2
C1
A3
C2
A4
C3
A5
Tendons of flexor digitorum superficialis and profundus muscles
(Synovial) tendon sheath
Palmar ligaments (palmar plates)

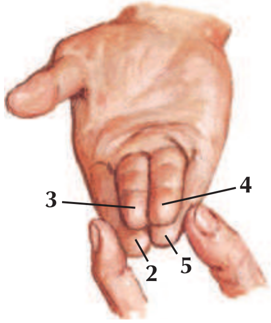
Flexor Tendons, Arteries, and Nerves at Wrist

See also Plates 462, 463


Palmar view
Adductor pollicis muscle
Flexor pollicis brevis muscle *(reflected)*
Lumbrical muscles
Superficial palmar (arterial) arch
Abductor pollicis brevis muscle *(reflected)*
Opponens digiti minimi muscle
Flexor digiti minimi brevis muscle
Opponens pollicis muscle *(cut)*
1st metacarpal bone
Abductor digiti minimi muscle
Trapezium bone
Flexor retinaculum (transverse carpal ligament)
Pisiform bone
(Synovial) tendon sheath
Palmar carpal ligament *(reflected)*
Flexor carpi ulnaris tendon
Ulnar nerve
Ulnar artery
Flexor pollicis longus tendon in tendon sheath
Flexor carpi radialis tendon
Common flexor sheath
Radial artery
Median nerve
Palmaris longus tendon
Flexor digitorum superficialis tendons
F. Netter M.D.

Cross section of wrist demonstrating carpal tunnel

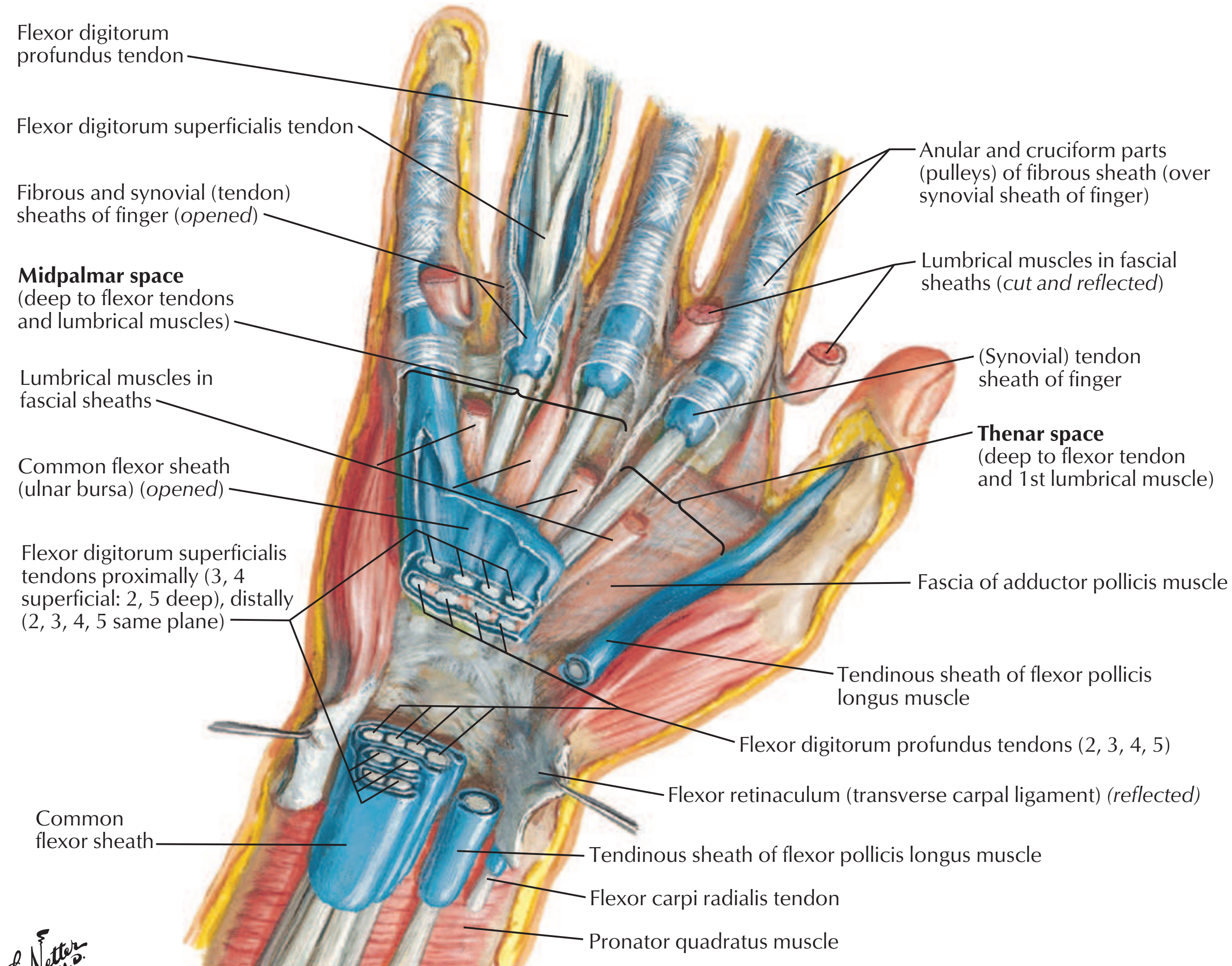

Flexor retinaculum (transverse carpal ligament)
Ulnar artery and nerve
Flexor carpi ulnaris tendon
Flexor digitorum superficialis tendons* (3, 4 superficial; 2, 5 deep)
Flexor digitorum profundus tendons* (2, 3, 4, 5)
Hamate bone
Capitate bone
Palmaris longus tendon
Median nerve*
Flexor carpi radialis tendon
Flexor pollicis longus tendon in tendon sheath*
Radial artery
Trapezium bone
Trapezoid bone



Simple method of demonstrating arrangement of flexor digitorum superficialis tendons within carpal tunnel

*Contents of carpal tunnel

Bursae, Spaces, and Tendon Sheaths of Hand



Flexor digitorum profundus tendon
Flexor digitorum superficialis tendon
Fibrous and synovial (tendon) sheaths of finger (*opened*)
Midpalmar space (deep to flexor tendons and lumbrical muscles)
Lumbrical muscles in fascial sheaths
Common flexor sheath (ulnar bursa) (*opened*)
Flexor digitorum superficialis tendons proximally (3, 4 superficial: 2, 5 deep), distally (2, 3, 4, 5 same plane)
Common flexor sheath
Anular and cruciform parts (pulleys) of fibrous sheath (over synovial sheath of finger)
Lumbrical muscles in fascial sheaths (*cut and reflected*)
(Synovial) tendon sheath of finger
Thenar space (deep to flexor tendon and 1st lumbrical muscle)
Fascia of adductor pollicis muscle
Tendinous sheath of flexor pollicis longus muscle
Flexor digitorum profundus tendons (2, 3, 4, 5)
Flexor retinaculum (transverse carpal ligament) (*reflected*)
Tendinous sheath of flexor pollicis longus muscle
Flexor carpi radialis tendon
Pronator quadratus muscle

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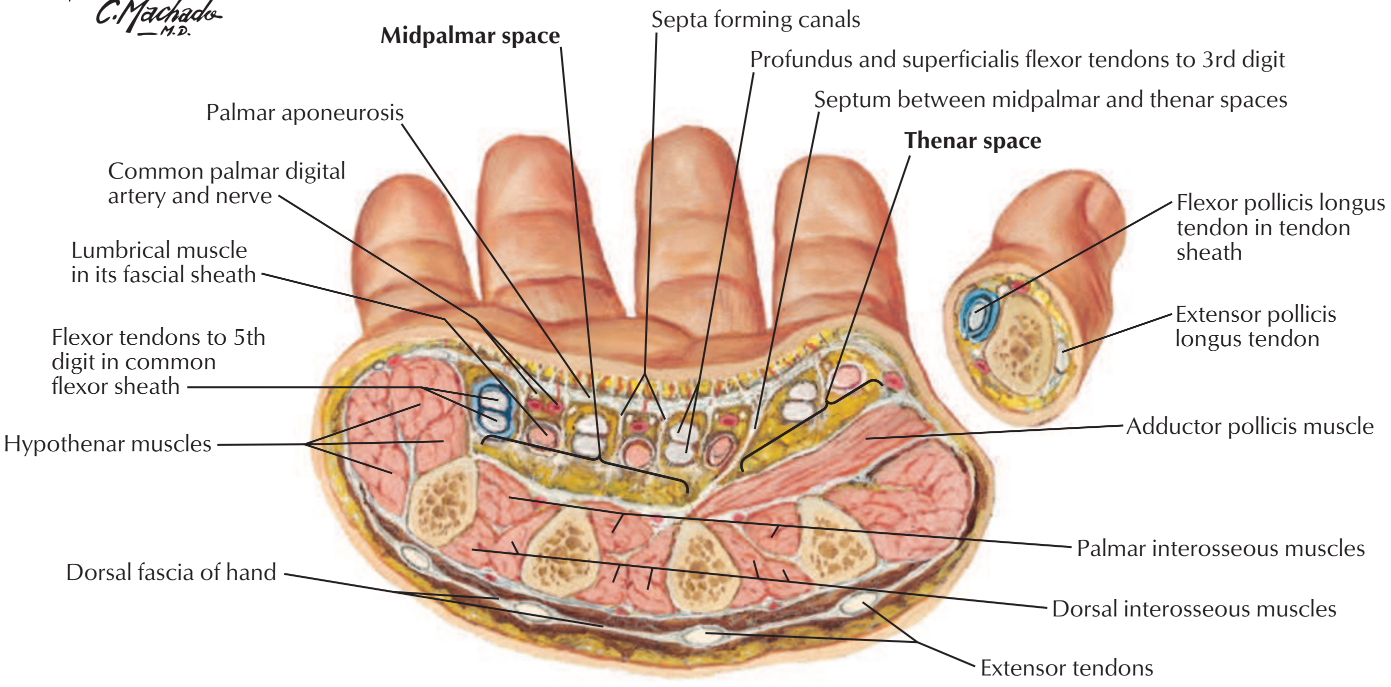
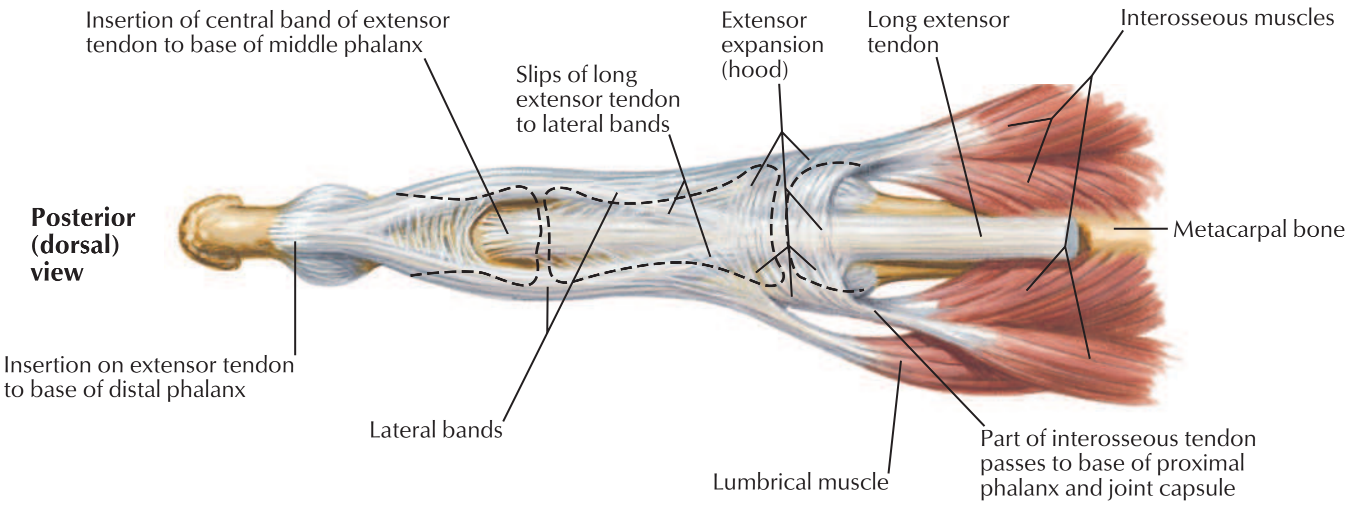
C. Machado M.D.

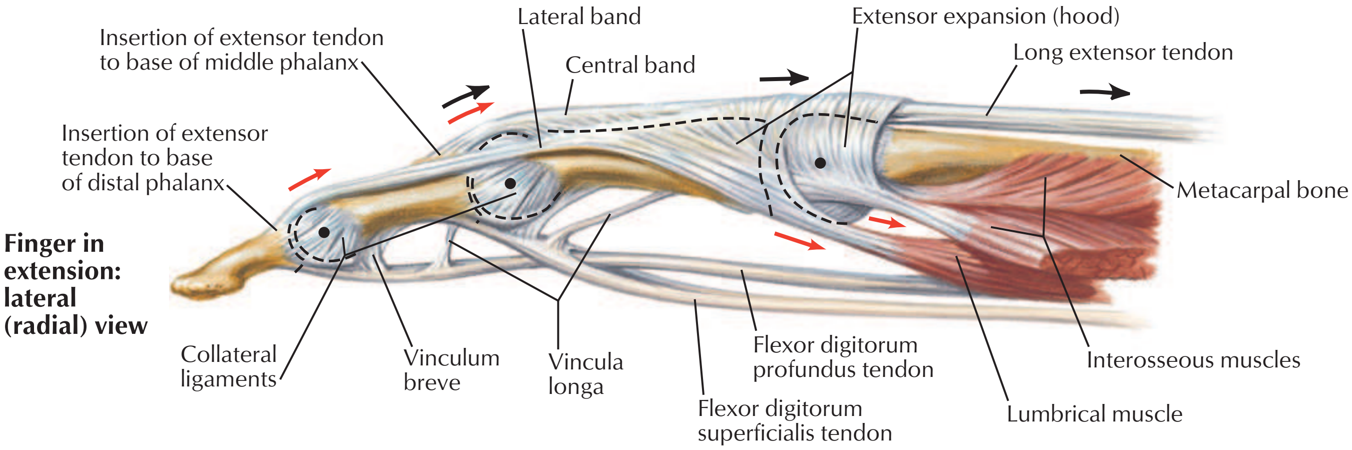


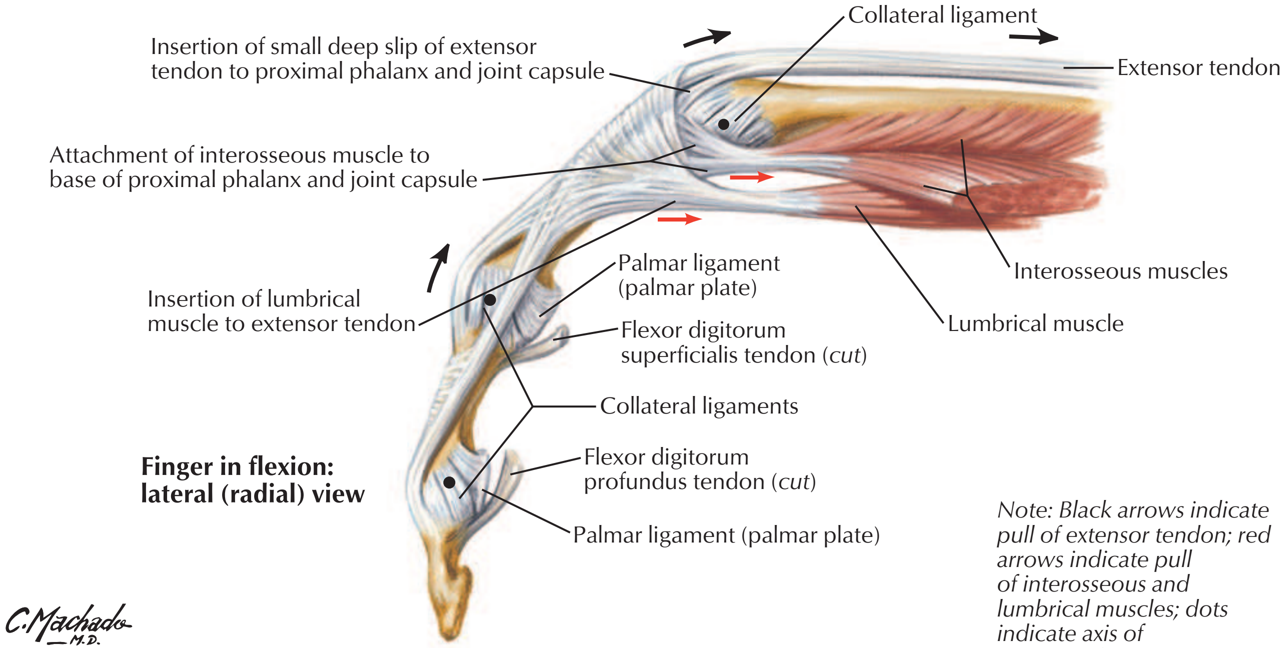
Midpalmar space
Septa forming canals
Profundus and superficialis flexor tendons to 3rd digit
Septum between midpalmar and thenar spaces
Thenar space
Palmar aponeurosis
Common palmar digital artery and nerve
Lumbrical muscle in its fascial sheath
Flexor tendons to 5th digit in common flexor sheath
Hypothenar muscles
Dorsal fascia of hand
Flexor pollicis longus tendon in tendon sheath
Extensor pollicis longus tendon
Adductor pollicis muscle
Palmar interosseous muscles
Dorsal interosseous muscles
Extensor tendons

Flexor and Extensor Tendons in Fingers

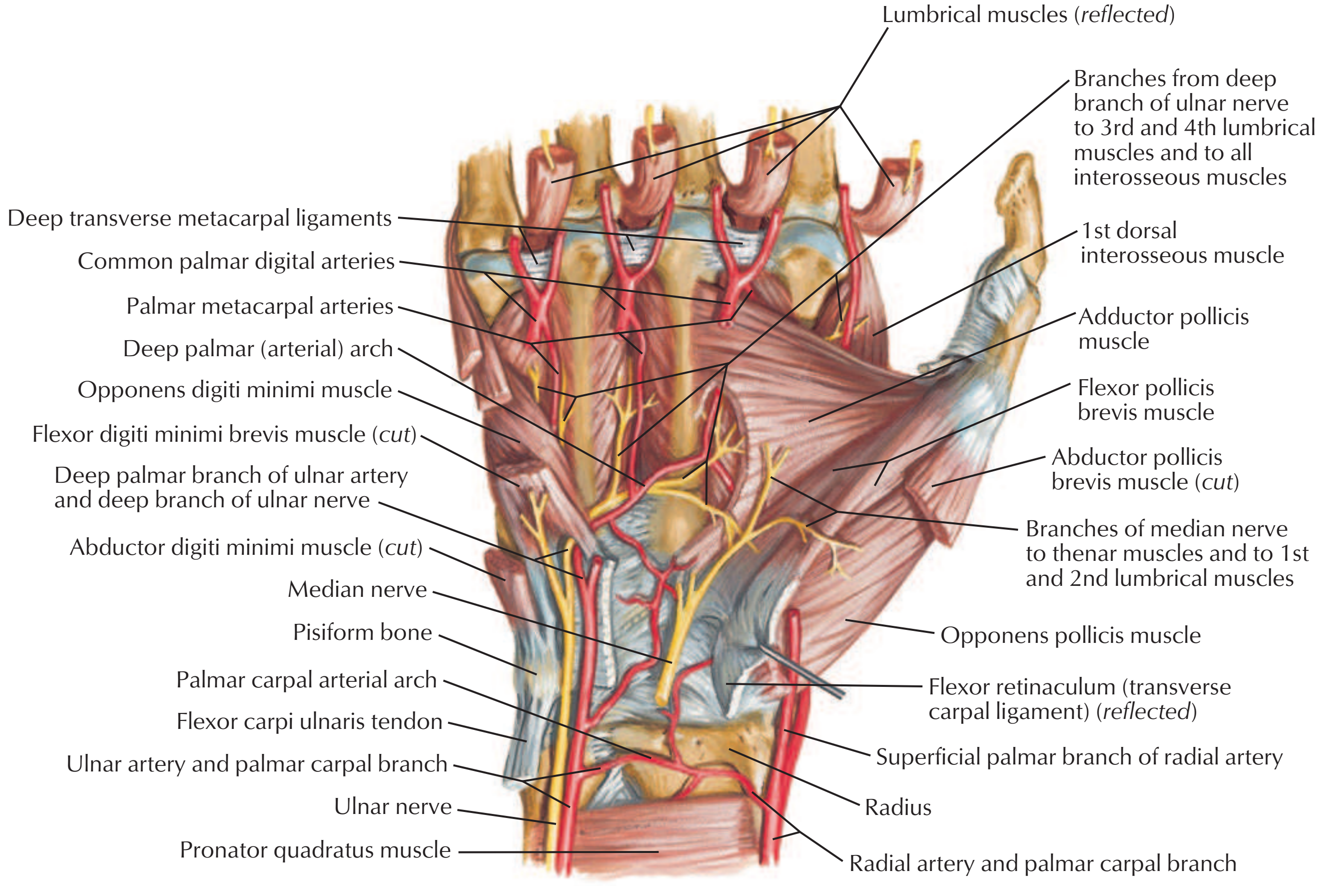
See also Plate 455


Insertion of central band of extensor tendon to base of middle phalanx
Slips of long extensor tendon to lateral bands
Extensor expansion (hood)
Long extensor tendon
Interosseous muscles
Posterior (dorsal) view
Metacarpal bone
Insertion on extensor tendon to base of distal phalanx
Lateral bands
Lumbrical muscle
Part of interosseous tendon passes to base of proximal phalanx and joint capsule

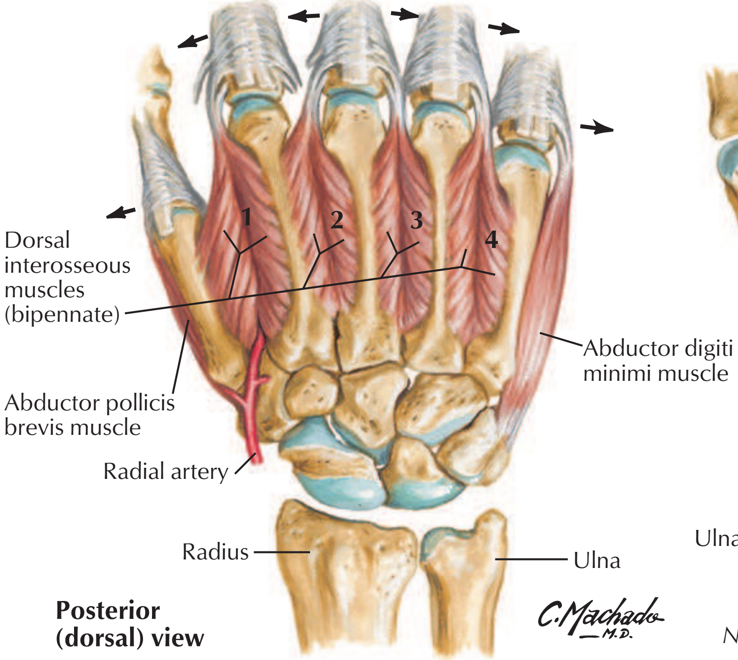

Insertion of extensor tendon to base of middle phalanx
Lateral band
Central band
Extensor expansion (hood)
Long extensor tendon
Insertion of extensor tendon to base of distal phalanx
Metacarpal bone
Finger in extension: lateral (radial) view
Collateral ligaments
Vinculum breve
Vincula longa
Flexor digitorum profundus tendon
Flexor digitorum superficialis tendon
Interosseous muscles
Lumbrical muscle


Collateral ligament
Insertion of small deep slip of extensor tendon to proximal phalanx and joint capsule
Extensor tendon
Attachment of interosseous muscle to base of proximal phalanx and joint capsule
Palmar ligament (palmar plate)
Interosseous muscles
Insertion of lumbrical muscle to extensor tendon
Flexor digitorum superficialis tendon (cut)
Lumbrical muscle
Collateral ligaments
Finger in flexion: lateral (radial) view
Flexor digitorum profundus tendon (cut)
Palmar ligament (palmar plate)
C. Machado M.D.

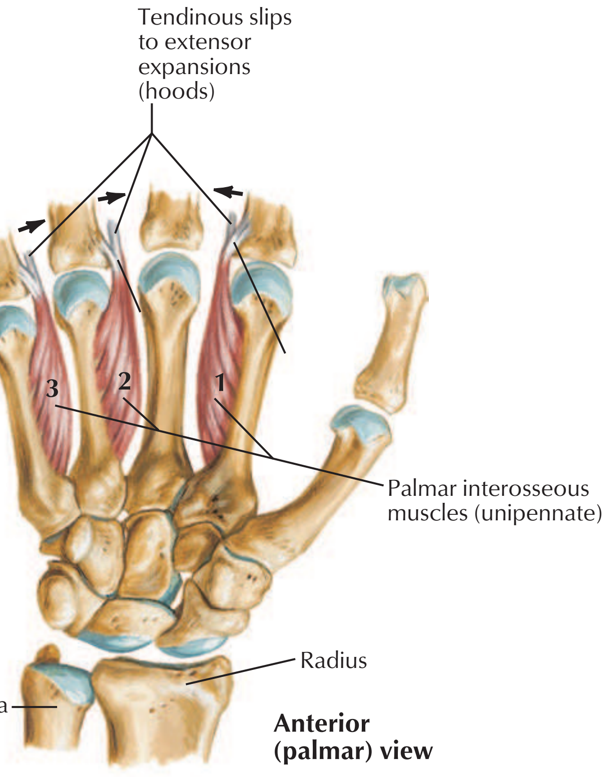
Note: Black arrows indicate pull of extensor tendon; red arrows indicate pull of interosseous and lumbrical muscles; dots indicate axis of rotation of joints.


Lumbrical muscles (*reflected*)
Branches from deep branch of ulnar nerve to 3rd and 4th lumbrical muscles and to all interosseous muscles
Deep transverse metacarpal ligaments
Common palmar digital arteries
Palmar metacarpal arteries
Deep palmar (arterial) arch
Opponens digiti minimi muscle
Flexor digiti minimi brevis muscle (*cut*)
Deep palmar branch of ulnar artery and deep branch of ulnar nerve
Abductor digiti minimi muscle (*cut*)
Median nerve
Pisiform bone
Palmar carpal arterial arch
Flexor carpi ulnaris tendon
Ulnar artery and palmar carpal branch
Ulnar nerve
Pronator quadratus muscle
1st dorsal interosseous muscle
Adductor pollicis muscle
Flexor pollicis brevis muscle
Abductor pollicis brevis muscle (*cut*)
Branches of median nerve to thenar muscles and to 1st and 2nd lumbrical muscles
Opponens pollicis muscle
Flexor retinaculum (transverse carpal ligament) (*reflected*)
Superficial palmar branch of radial artery
Radius
Radial artery and palmar carpal branch

Anterior (palmar) view


1
2
3
4
Dorsal interosseous muscles (bipennate)
Abductor pollicis brevis muscle
Radial artery
Radius
Abductor digiti minimi muscle
Ulna

Posterior (dorsal) view

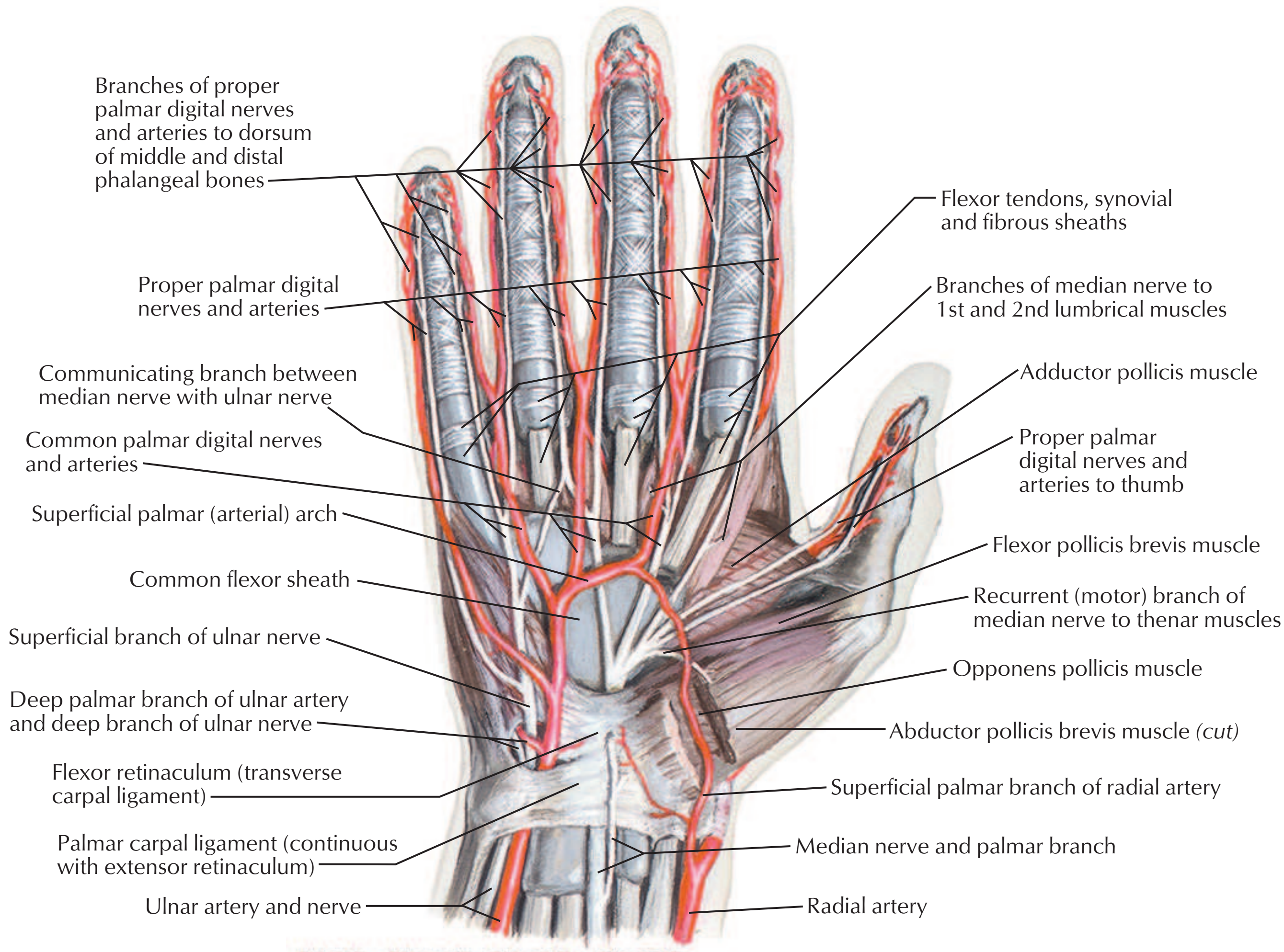

Tendinous slips to extensor expansions (hoods)
3
2
1
Palmar interosseous muscles (unipennate)
Radius
Ulna

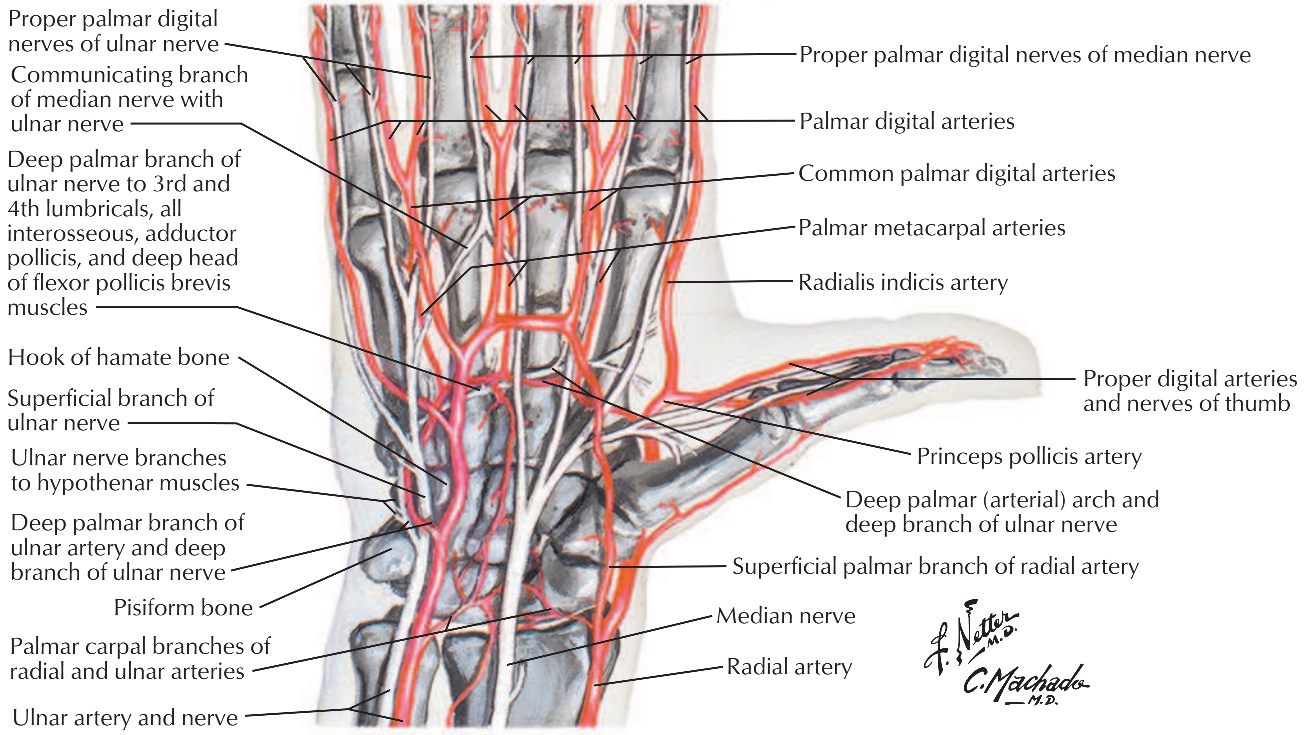
Anterior (palmar) view

Note: Arrows indicate action of muscles.

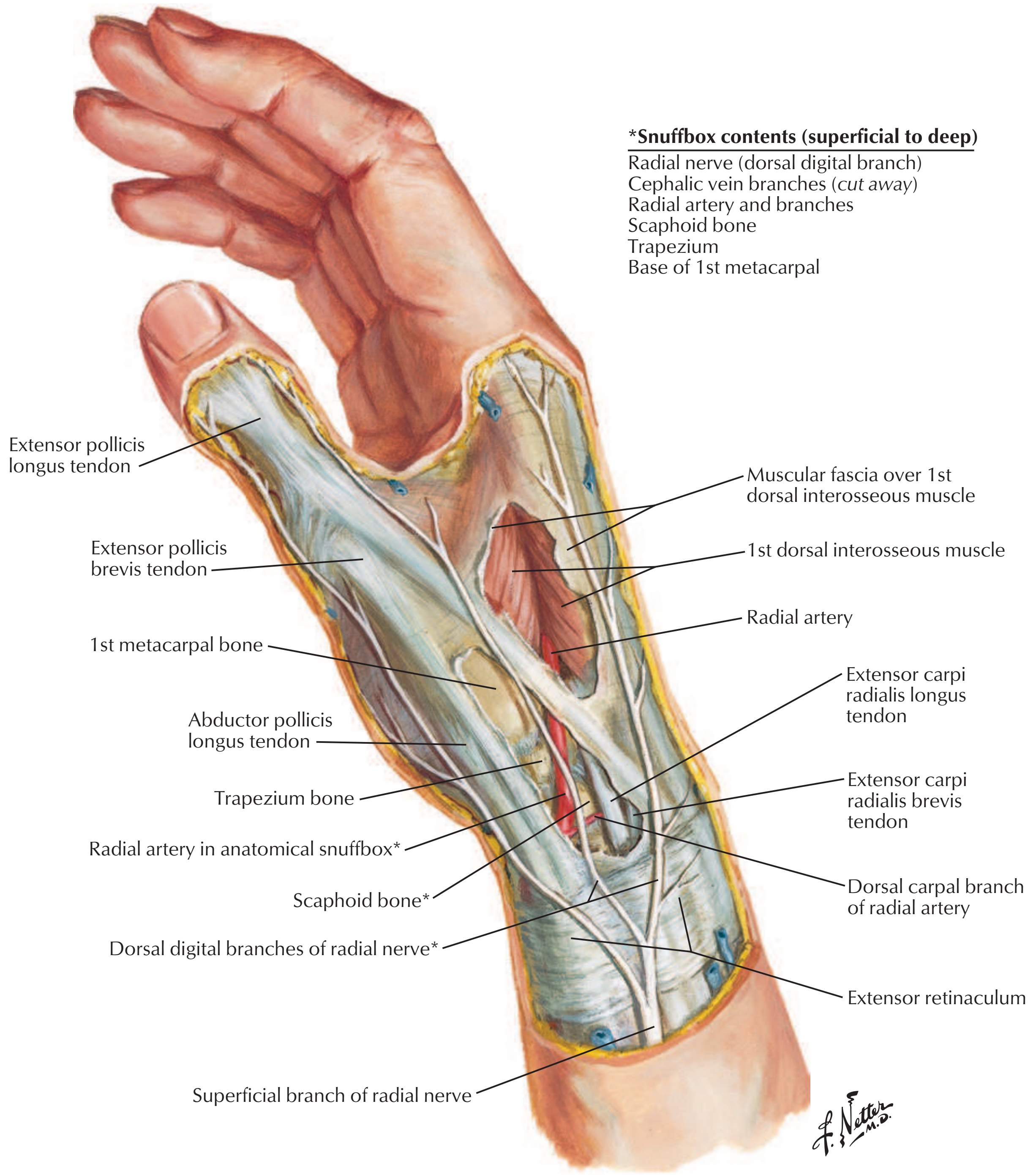
Arteries and Nerves of Hand: Palmar Views

See also Plate 424


Branches of proper palmar digital nerves and arteries to dorsum of middle and distal phalangeal bones
Proper palmar digital nerves and arteries
Communicating branch between median nerve with ulnar nerve
Common palmar digital nerves and arteries
Superficial palmar (arterial) arch
Common flexor sheath
Superficial branch of ulnar nerve
Deep palmar branch of ulnar artery and deep branch of ulnar nerve
Flexor retinaculum (transverse carpal ligament)
Palmar carpal ligament (continuous with extensor retinaculum)
Ulnar artery and nerve
Flexor tendons, synovial and fibrous sheaths
Branches of median nerve to 1st and 2nd lumbrical muscles
Adductor pollicis muscle
Proper palmar digital nerves and arteries to thumb
Flexor pollicis brevis muscle
Recurrent (motor) branch of median nerve to thenar muscles
Opponens pollicis muscle
Abductor pollicis brevis muscle *(cut)*
Superficial palmar branch of radial artery
Median nerve and palmar branch
Radial artery


Proper palmar digital nerves of ulnar nerve
Communicating branch of median nerve with ulnar nerve
Deep palmar branch of ulnar nerve to 3rd and 4th lumbricals, all interosseous, adductor pollicis, and deep head of flexor pollicis brevis muscles
Hook of hamate bone
Superficial branch of ulnar nerve
Ulnar nerve branches to hypothenar muscles
Deep palmar branch of ulnar artery and deep branch of ulnar nerve
Pisiform bone
Palmar carpal branches of radial and ulnar arteries
Ulnar artery and nerve
Proper palmar digital nerves of median nerve
Palmar digital arteries
Common palmar digital arteries
Palmar metacarpal arteries
Radialis indicis artery
Proper digital arteries and nerves of thumb
Princeps pollicis artery
Deep palmar (arterial) arch and deep branch of ulnar nerve
Superficial palmar branch of radial artery
Median nerve
Radial artery
F. Netter M.D.
C. Machado M.D.

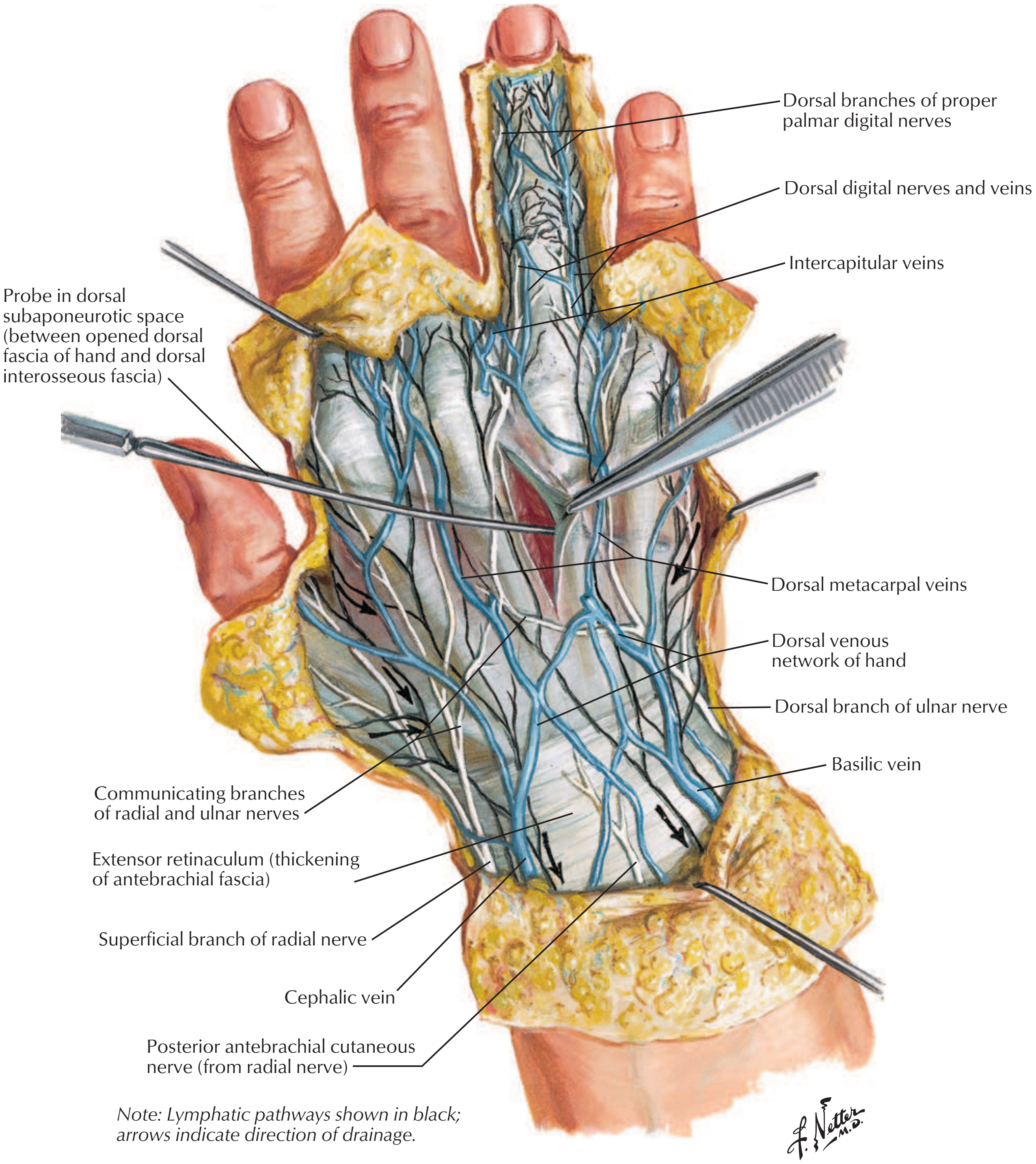
See also **Plate 469**


Extensor pollicis longus tendon
Extensor pollicis brevis tendon
1st metacarpal bone
Abductor pollicis longus tendon
Trapezium bone
Radial artery in anatomical snuffbox*
Scaphoid bone*
Dorsal digital branches of radial nerve*
Superficial branch of radial nerve
Muscular fascia over 1st dorsal interosseous muscle
1st dorsal interosseous muscle
Radial artery
Extensor carpi radialis longus tendon
Extensor carpi radialis brevis tendon
Dorsal carpal branch of radial artery
Extensor retinaculum

***Snuffbox contents (superficial to deep)**
Radial nerve (dorsal digital branch)
Cephalic vein branches (*cut away*)
Radial artery and branches
Scaphoid bone
Trapezium
Base of 1st metacarpal

Wrist and Hand: Superficial Dorsal Dissection

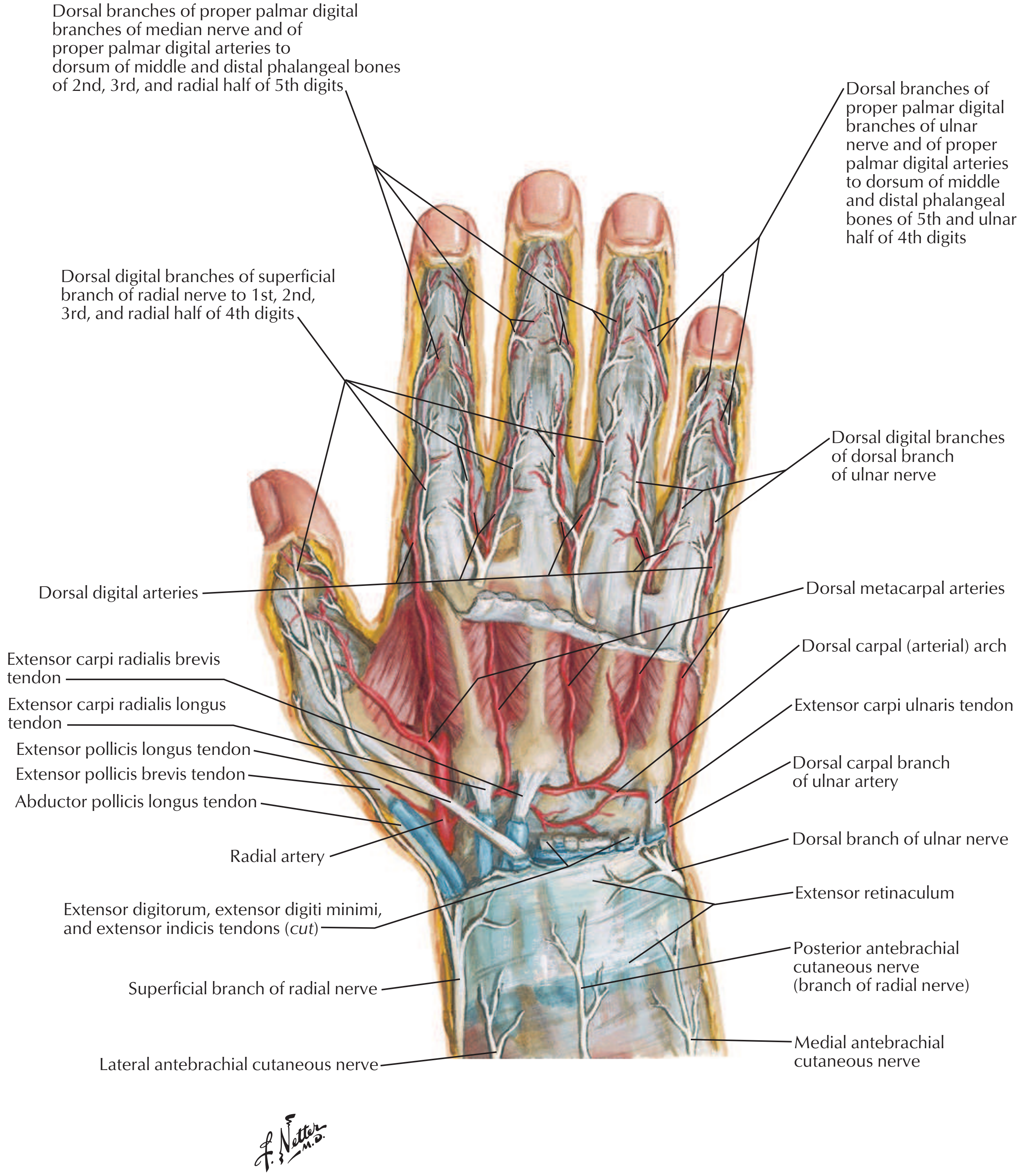
See also Plate 406


Dorsal branches of proper palmar digital nerves
Dorsal digital nerves and veins
Intercapitular veins
Probe in dorsal subaponeurotic space (between opened dorsal fascia of hand and dorsal interosseous fascia)
Dorsal metacarpal veins
Dorsal venous network of hand
Dorsal branch of ulnar nerve
Basilic vein
Communicating branches of radial and ulnar nerves
Extensor retinaculum (thickening of antebrachial fascia)
Superficial branch of radial nerve
Cephalic vein
Posterior antebrachial cutaneous nerve (from radial nerve)

Note: Lymphatic pathways shown in black; arrows indicate direction of drainage.

Nerves and Arteries of Dorsal Hand and Wrist

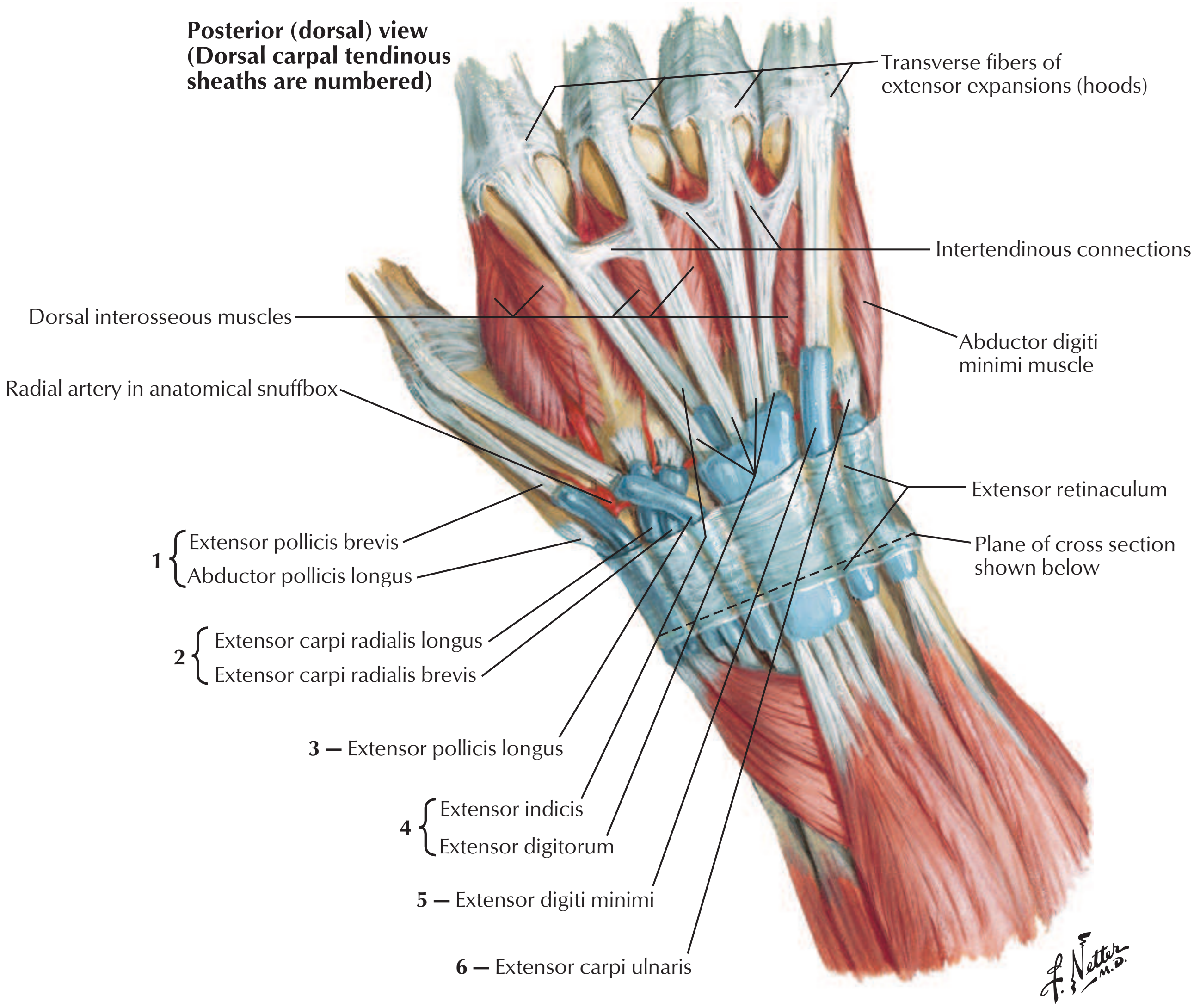
See also **Plate 460**



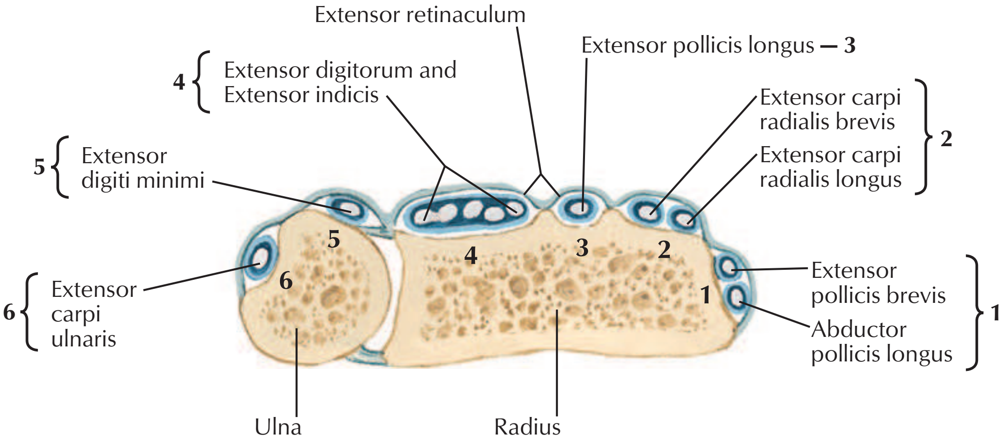
Dorsal branches of proper palmar digital branches of median nerve and of proper palmar digital arteries to dorsum of middle and distal phalangeal bones of 2nd, 3rd, and radial half of 5th digits
Dorsal branches of proper palmar digital branches of ulnar nerve and of proper palmar digital arteries to dorsum of middle and distal phalangeal bones of 5th and ulnar half of 4th digits
Dorsal digital branches of superficial branch of radial nerve to 1st, 2nd, 3rd, and radial half of 4th digits
Dorsal digital branches of dorsal branch of ulnar nerve
Dorsal digital arteries
Dorsal metacarpal arteries
Extensor carpi radialis brevis tendon
Dorsal carpal (arterial) arch
Extensor carpi radialis longus tendon
Extensor carpi ulnaris tendon
Extensor pollicis longus tendon
Dorsal carpal branch of ulnar artery
Extensor pollicis brevis tendon
Abductor pollicis longus tendon
Dorsal branch of ulnar nerve
Radial artery
Extensor retinaculum
Extensor digitorum, extensor digiti minimi, and extensor indicis tendons (*cut*)
Posterior antebrachial cutaneous nerve (branch of radial nerve)
Superficial branch of radial nerve
Medial antebrachial cutaneous nerve
Lateral antebrachial cutaneous nerve

See also Plates 434, 435

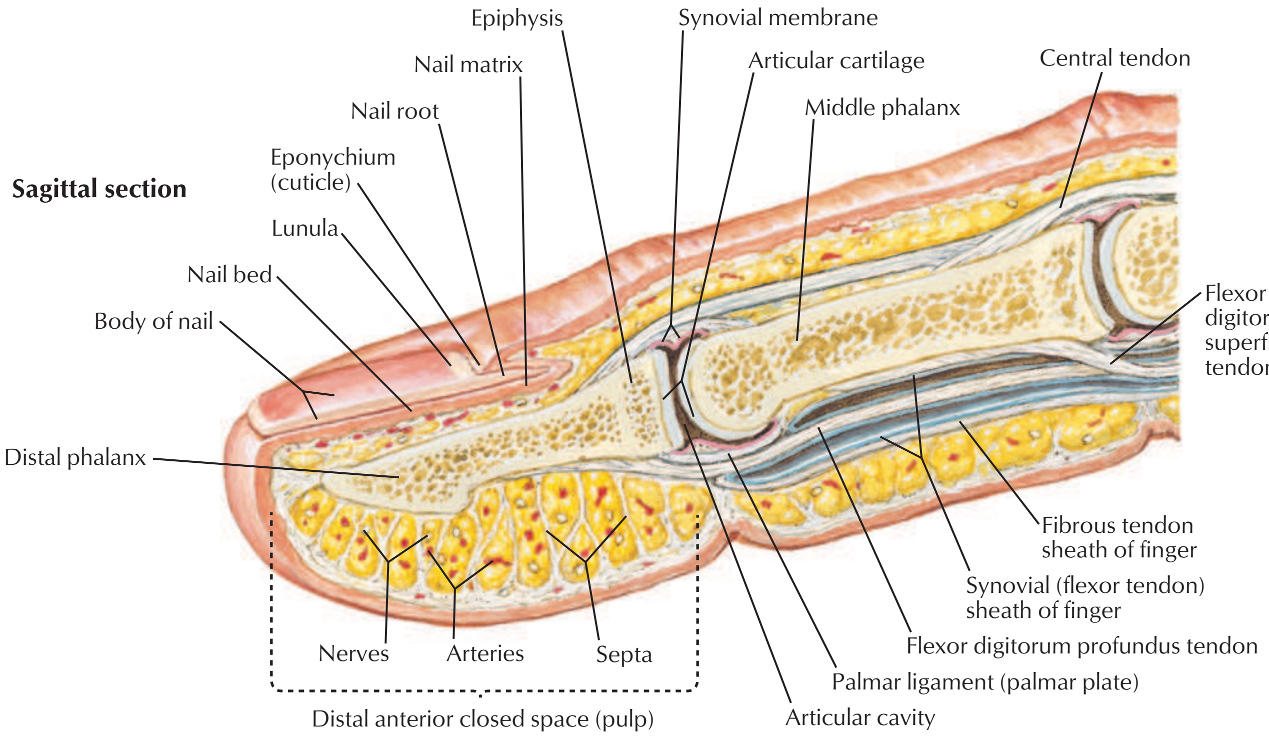
Posterior (dorsal) view (Dorsal carpal tendinous sheaths are numbered)

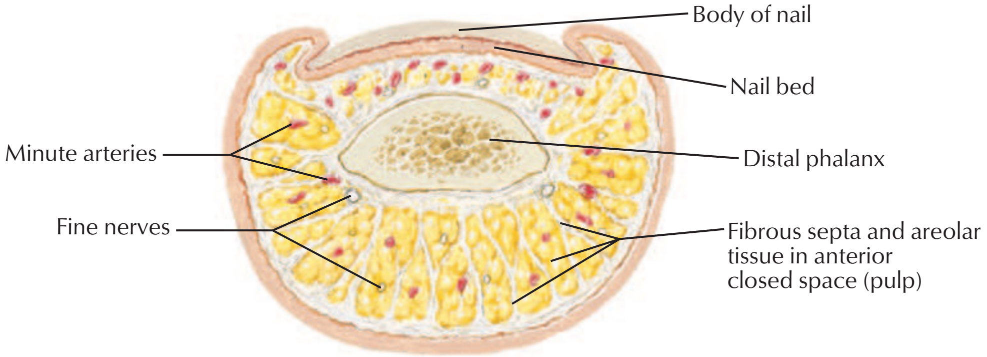

Transverse fibers of extensor expansions (hoods)
Intertendinous connections
Dorsal interosseous muscles
Abductor digiti minimi muscle
Radial artery in anatomical snuffbox
Extensor retinaculum
Plane of cross section shown below
1 { Extensor pollicis brevis
Abductor pollicis longus
2 { Extensor carpi radialis longus
Extensor carpi radialis brevis
3 — Extensor pollicis longus
4 { Extensor indicis
Extensor digitorum
5 — Extensor digiti minimi
6 — Extensor carpi ulnaris
F. Netter M.D.

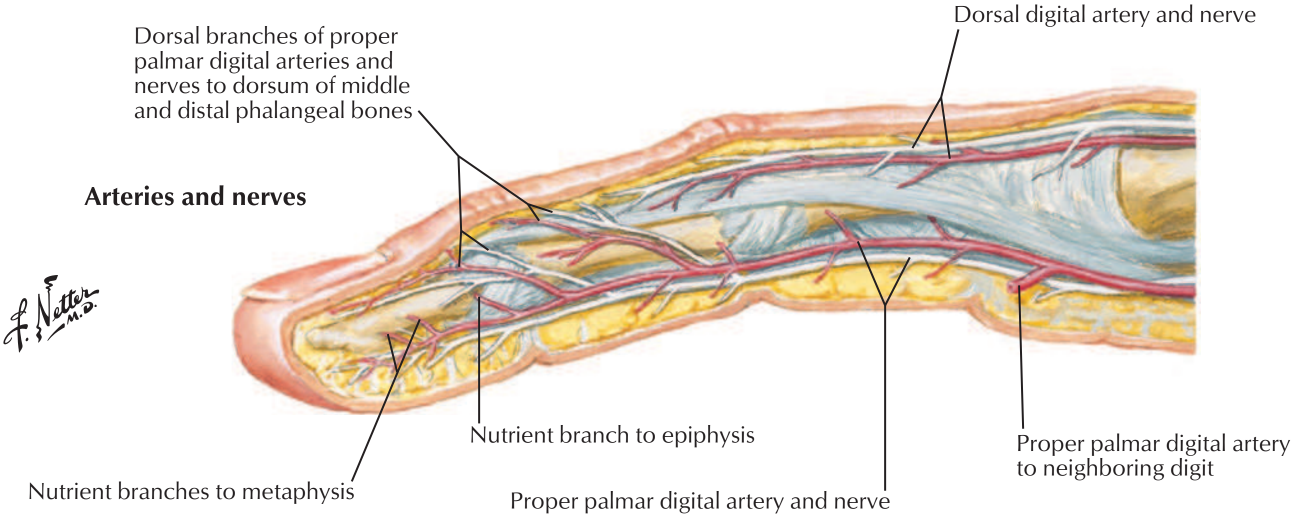
Cross section of most distal portion of forearm


Extensor retinaculum
Extensor pollicis longus — 3
4 { Extensor digitorum and Extensor indicis
Extensor carpi radialis brevis
Extensor carpi radialis longus
} 2
5 { Extensor digiti minimi
6 { Extensor carpi ulnaris
Extensor pollicis brevis
Abductor pollicis longus
} 1
5
4
3
2
6
1
Ulna
Radius

Fingers

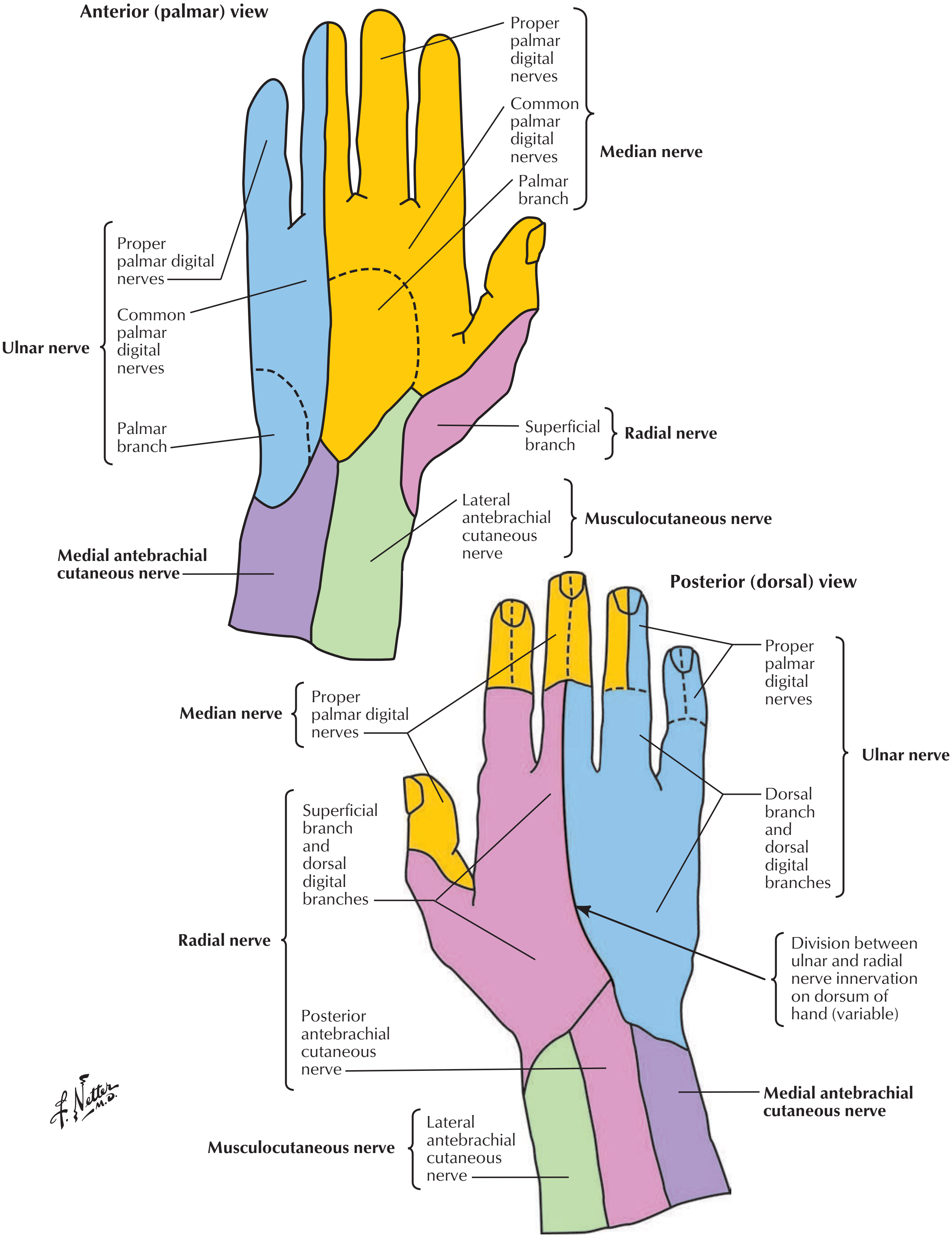

Sagittal section
Epiphysis
Synovial membrane
Nail matrix
Articular cartilage
Central tendon
Nail root
Middle phalanx
Eponychium (cuticle)
Lunula
Nail bed
Body of nail
Flexor digitorum superficialis tendon
Distal phalanx
Fibrous tendon sheath of finger
Synovial (flexor tendon) sheath of finger
Nerves
Arteries
Septa
Flexor digitorum profundus tendon
Palmar ligament (palmar plate)
Distal anterior closed space (pulp)
Articular cavity


Cross section through distal phalanx
Body of nail
Nail bed
Minute arteries
Distal phalanx
Fine nerves
Fibrous septa and areolar tissue in anterior closed space (pulp)


Arteries and nerves
Dorsal branches of proper palmar digital arteries and nerves to dorsum of middle and distal phalangeal bones
Dorsal digital artery and nerve
Nutrient branch to epiphysis
Proper palmar digital artery to neighboring digit
Nutrient branches to metaphysis
Proper palmar digital artery and nerve

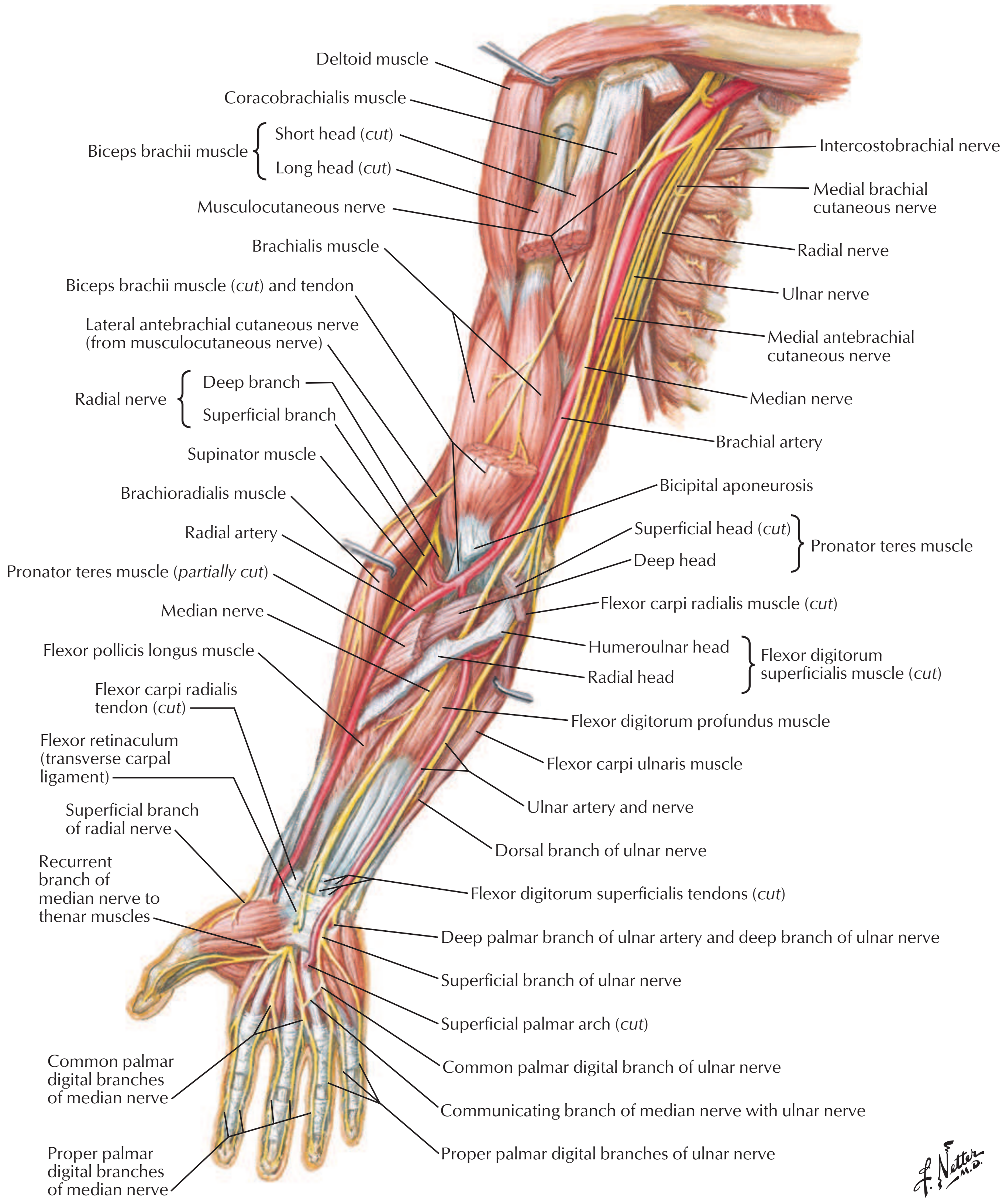
Cutaneous Innervation of Wrist and Hand

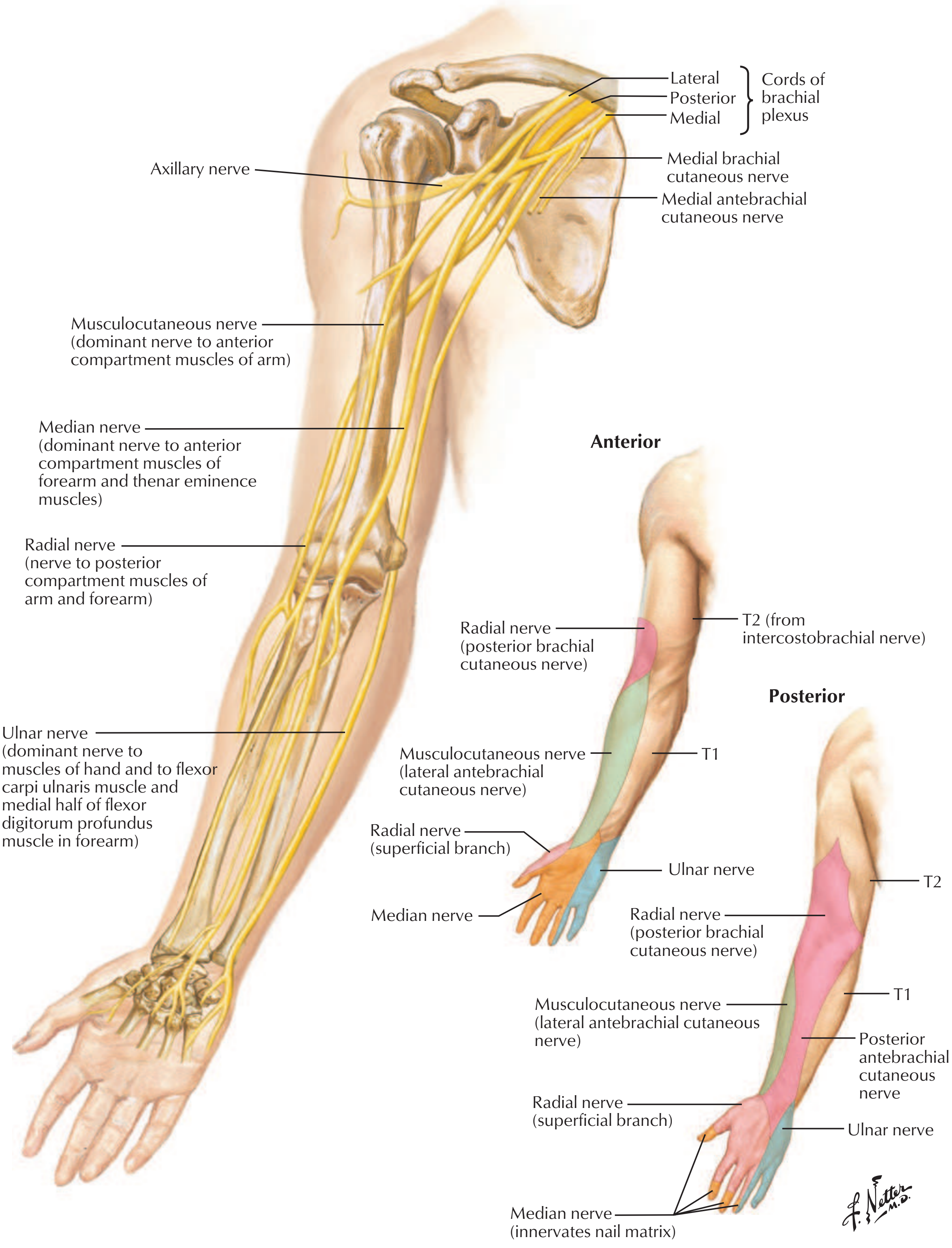
See also Plates 404, 452


Anterior (palmar) view
Proper palmar digital nerves
Common palmar digital nerves
Palmar branch
Median nerve
Proper palmar digital nerves
Common palmar digital nerves
Palmar branch
Ulnar nerve
Superficial branch
Radial nerve
Lateral antebrachial cutaneous nerve
Musculocutaneous nerve
Medial antebrachial cutaneous nerve
Posterior (dorsal) view
Median nerve
Proper palmar digital nerves
Proper palmar digital nerves
Ulnar nerve
Dorsal branch and dorsal digital branches
Superficial branch and dorsal digital branches
Radial nerve
Division between ulnar and radial nerve innervation on dorsum of hand (variable)
Posterior antebrachial cutaneous nerve
Medial antebrachial cutaneous nerve
Musculocutaneous nerve
Lateral antebrachial cutaneous nerve
F. Netter M.D.

Arteries and Nerves of Upper Limb: Anterior View

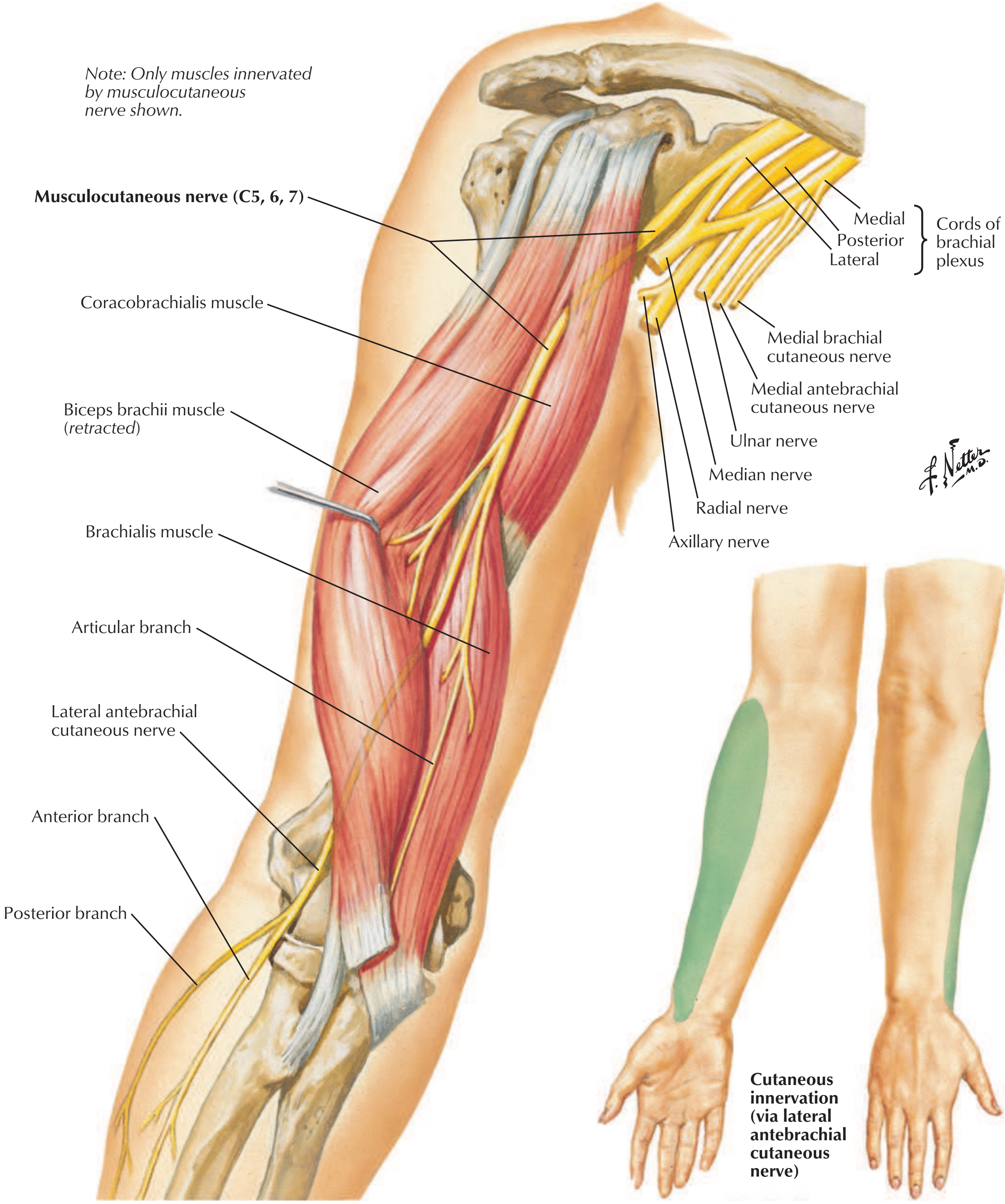
See also **Plates 423, 438**


Deltoid muscle
Coracobrachialis muscle
Biceps brachii muscle
Short head (*cut*)
Long head (*cut*)
Musculocutaneous nerve
Brachialis muscle
Biceps brachii muscle (*cut*) and tendon
Lateral antebrachial cutaneous nerve (from musculocutaneous nerve)
Radial nerve
Deep branch
Superficial branch
Supinator muscle
Brachioradialis muscle
Radial artery
Pronator teres muscle (*partially cut*)
Median nerve
Flexor pollicis longus muscle
Flexor carpi radialis tendon (*cut*)
Flexor retinaculum (transverse carpal ligament)
Superficial branch of radial nerve
Recurrent branch of median nerve to thenar muscles
Common palmar digital branches of median nerve
Proper palmar digital branches of median nerve
Intercostobrachial nerve
Medial brachial cutaneous nerve
Radial nerve
Ulnar nerve
Medial antebrachial cutaneous nerve
Median nerve
Brachial artery
Bicipital aponeurosis
Superficial head (*cut*)
Deep head
Pronator teres muscle
Flexor carpi radialis muscle (*cut*)
Humeroulnar head
Radial head
Flexor digitorum superficialis muscle (*cut*)
Flexor digitorum profundus muscle
Flexor carpi ulnaris muscle
Ulnar artery and nerve
Dorsal branch of ulnar nerve
Flexor digitorum superficialis tendons (*cut*)
Deep palmar branch of ulnar artery and deep branch of ulnar nerve
Superficial branch of ulnar nerve
Superficial palmar arch (*cut*)
Common palmar digital branch of ulnar nerve
Communicating branch of median nerve with ulnar nerve
Proper palmar digital branches of ulnar nerve


Lateral
Posterior
Medial
Cords of brachial plexus
Axillary nerve
Medial brachial cutaneous nerve
Medial antebrachial cutaneous nerve
Musculocutaneous nerve (dominant nerve to anterior compartment muscles of arm)
Median nerve (dominant nerve to anterior compartment muscles of forearm and thenar eminence muscles)
Radial nerve (nerve to posterior compartment muscles of arm and forearm)
Ulnar nerve (dominant nerve to muscles of hand and to flexor carpi ulnaris muscle and medial half of flexor digitorum profundus muscle in forearm)
Anterior
Radial nerve (posterior brachial cutaneous nerve)
T2 (from intercostobrachial nerve)
Musculocutaneous nerve (lateral antebrachial cutaneous nerve)
T1
Radial nerve (superficial branch)
Ulnar nerve
Median nerve
Posterior
T2
Radial nerve (posterior brachial cutaneous nerve)
T1
Musculocutaneous nerve (lateral antebrachial cutaneous nerve)
Posterior antebrachial cutaneous nerve
Radial nerve (superficial branch)
Ulnar nerve
Median nerve (innervates nail matrix)
F. Netter M.D.

Musculocutaneous Nerve: Anterior View

See also Plate 421



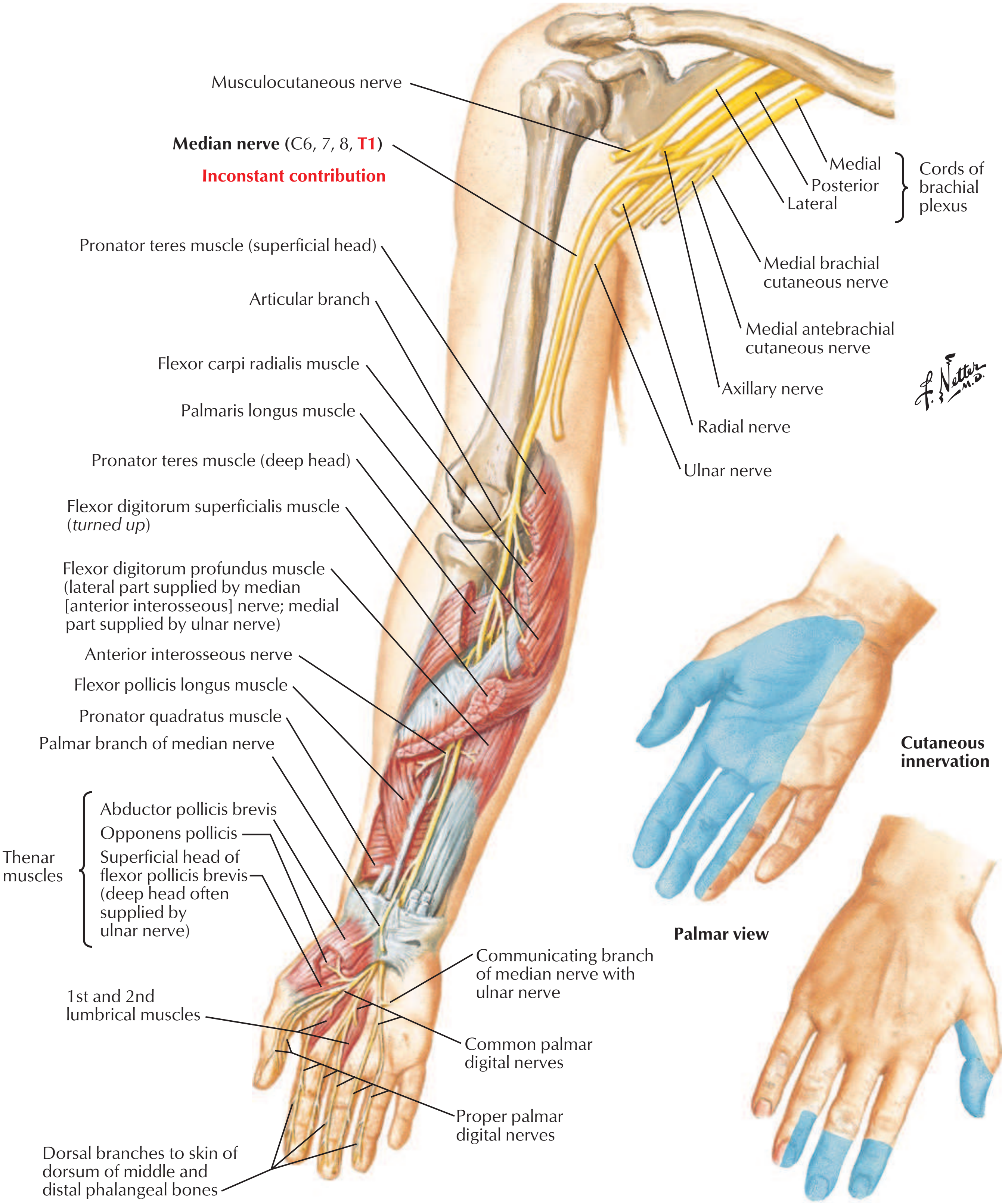
Note: Only muscles innervated by musculocutaneous nerve shown.
Musculocutaneous nerve (C5, 6, 7)
Coracobrachialis muscle
Biceps brachii muscle (*retracted*)
Brachialis muscle
Articular branch
Lateral antebrachial cutaneous nerve
Anterior branch
Posterior branch
Medial
Posterior
Lateral
Cords of brachial plexus
Medial brachial cutaneous nerve
Medial antebrachial cutaneous nerve
Ulnar nerve
Median nerve
Radial nerve
Axillary nerve

Cutaneous innervation (via lateral antebrachial cutaneous nerve)

Anterior (palmar) view **Posterior (dorsal) view**

See also Plates 404, 436, 437

Note: Only muscles innervated by median nerve shown.

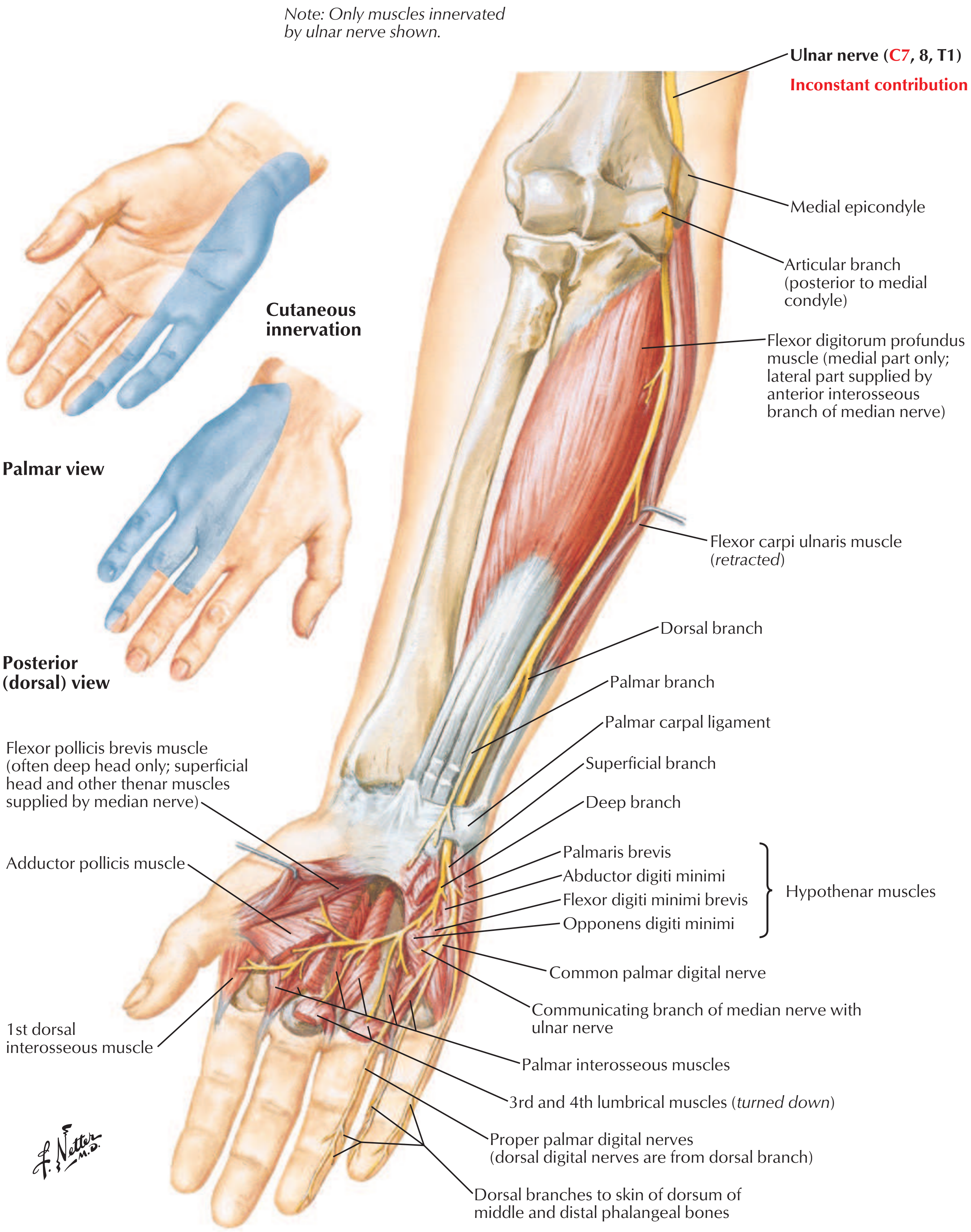

Musculocutaneous nerve
Median nerve (C6, 7, 8, T1)
Inconstant contribution
Pronator teres muscle (superficial head)
Articular branch
Flexor carpi radialis muscle
Palmaris longus muscle
Pronator teres muscle (deep head)
Flexor digitorum superficialis muscle (*turned up*)
Flexor digitorum profundus muscle (lateral part supplied by median [anterior interosseous] nerve; medial part supplied by ulnar nerve)
Anterior interosseous nerve
Flexor pollicis longus muscle
Pronator quadratus muscle
Palmar branch of median nerve
Thenar muscles
Abductor pollicis brevis
Opponens pollicis
Superficial head of flexor pollicis brevis (deep head often supplied by ulnar nerve)
1st and 2nd lumbrical muscles
Dorsal branches to skin of dorsum of middle and distal phalangeal bones
Medial
Posterior
Lateral
Cords of brachial plexus
Medial brachial cutaneous nerve
Medial antebrachial cutaneous nerve
Axillary nerve
Radial nerve
Ulnar nerve
Communicating branch of median nerve with ulnar nerve
Common palmar digital nerves
Proper palmar digital nerves

Cutaneous innervation
Palmar view

Posterior (dorsal) view

Ulnar Nerve

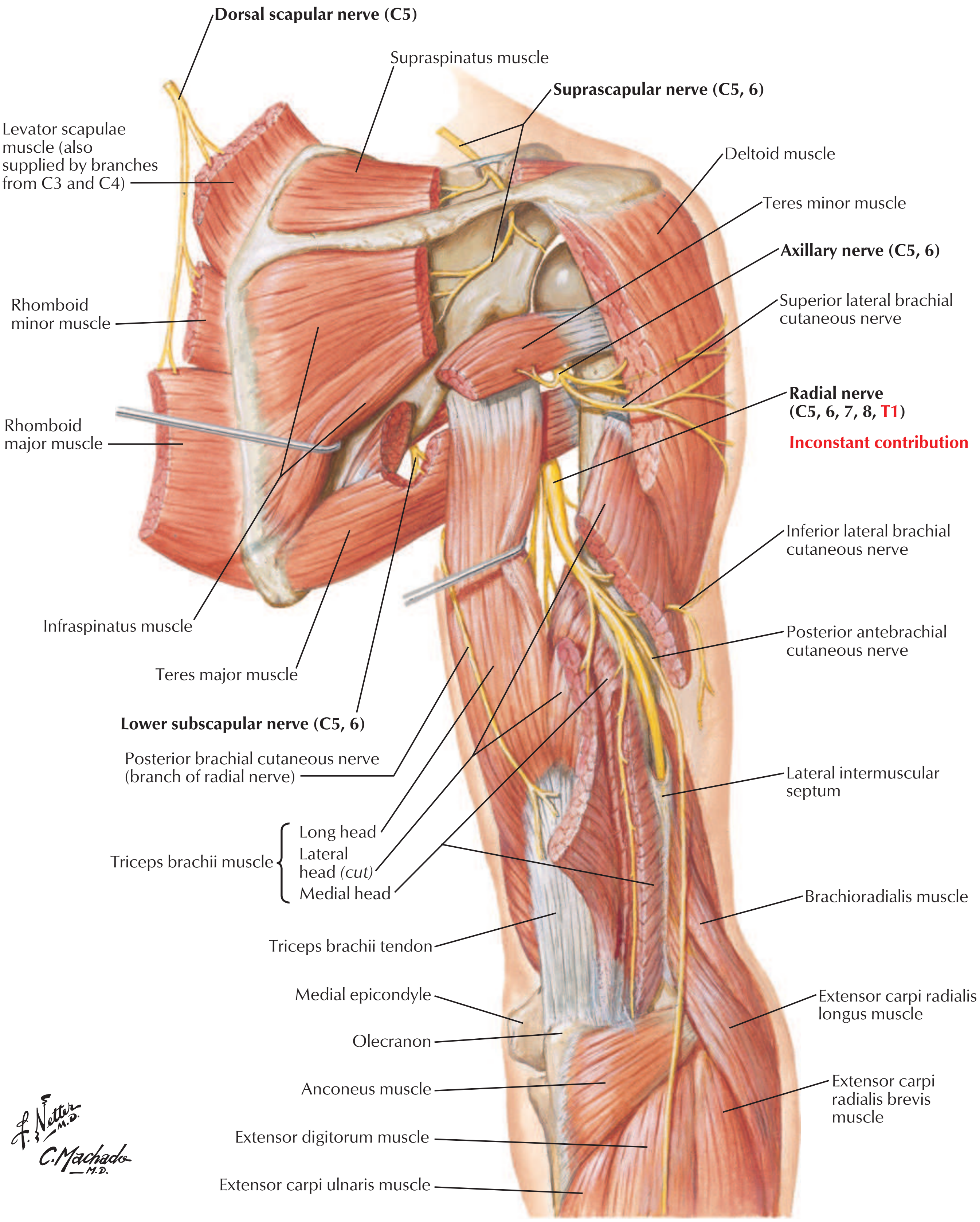
See also Plates 436, 438



Note: Only muscles innervated by ulnar nerve shown.
Ulnar nerve (C7, 8, T1)
Inconstant contribution
Medial epicondyle
Articular branch (posterior to medial condyle)
Flexor digitorum profundus muscle (medial part only; lateral part supplied by anterior interosseous branch of median nerve)
Flexor carpi ulnaris muscle (*retracted*)
Dorsal branch
Palmar branch
Palmar carpal ligament
Superficial branch
Deep branch
Palmaris brevis
Abductor digiti minimi
Flexor digiti minimi brevis
Opponens digiti minimi
Hypothenar muscles
Common palmar digital nerve
Communicating branch of median nerve with ulnar nerve
Palmar interosseous muscles
3rd and 4th lumbrical muscles (*turned down*)
Proper palmar digital nerves (dorsal digital nerves are from dorsal branch)
Dorsal branches to skin of dorsum of middle and distal phalangeal bones
Cutaneous innervation
Palmar view
Posterior (dorsal) view
Flexor pollicis brevis muscle (often deep head only; superficial head and other thenar muscles supplied by median nerve)
Adductor pollicis muscle
1st dorsal interosseous muscle

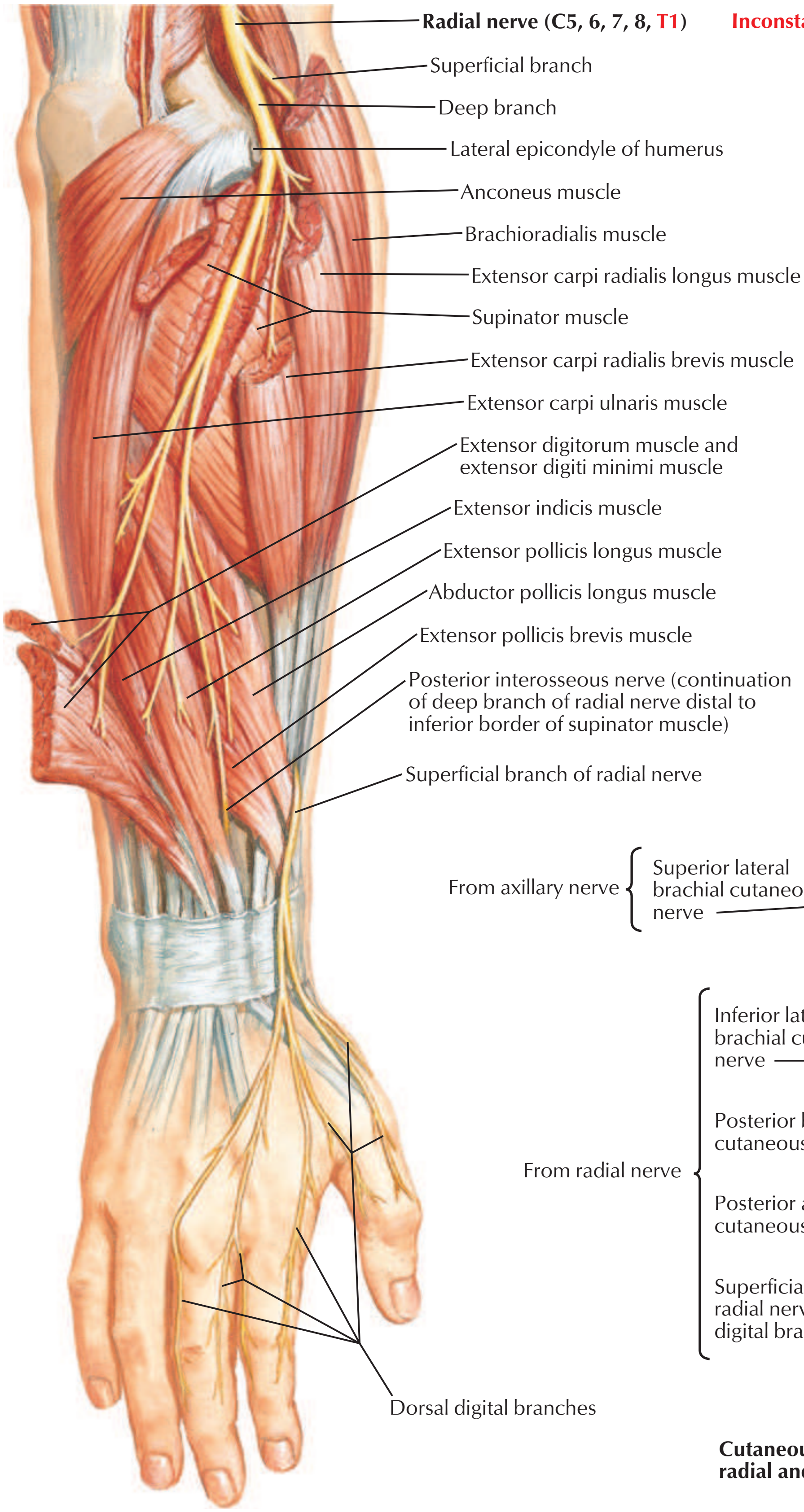
Radial Nerve in Arm and Nerves of Posterior Shoulder: Posterior View

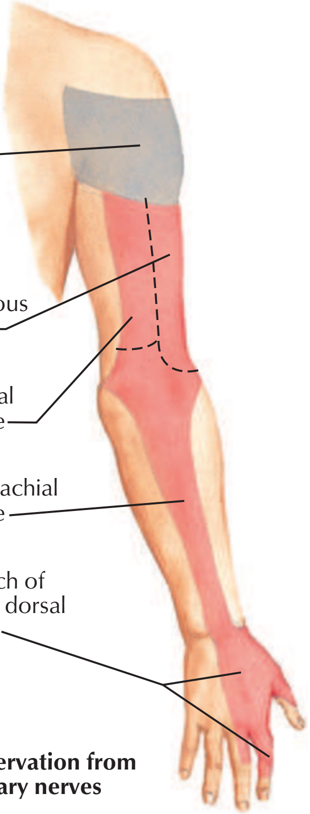
See also Plates 417, 422


Dorsal scapular nerve (C5)
Supraspinatus muscle
Suprascapular nerve (C5, 6)
Levator scapulae muscle (also supplied by branches from C3 and C4)
Deltoid muscle
Teres minor muscle
Axillary nerve (C5, 6)
Rhomboid minor muscle
Superior lateral brachial cutaneous nerve
Radial nerve (C5, 6, 7, 8, T1)
Inconstant contribution
Rhomboid major muscle
Inferior lateral brachial cutaneous nerve
Infraspinatus muscle
Posterior antebrachial cutaneous nerve
Teres major muscle
Lower subscapular nerve (C5, 6)
Posterior brachial cutaneous nerve (branch of radial nerve)
Lateral intermuscular septum
Triceps brachii muscle
Long head
Lateral head (cut)
Medial head
Brachioradialis muscle
Triceps brachii tendon
Medial epicondyle
Extensor carpi radialis longus muscle
Olecranon
Anconeus muscle
Extensor carpi radialis brevis muscle
Extensor digitorum muscle
Extensor carpi ulnaris muscle

Radial Nerve in Forearm and Hand

See also Plates 434, 457

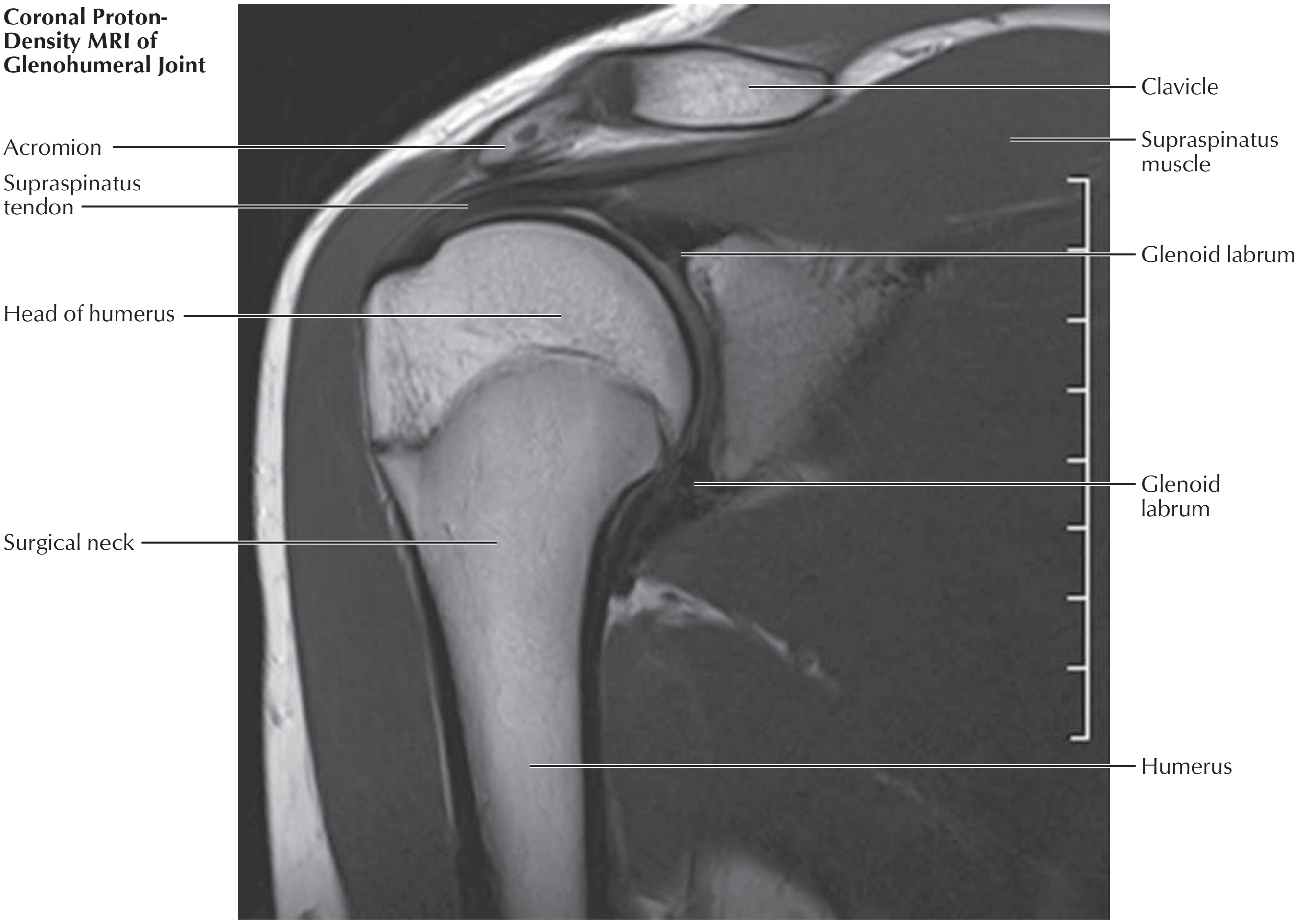

Radial nerve (C5, 6, 7, 8, T1)
Inconstant contribution
Superficial branch
Deep branch
Lateral epicondyle of humerus
Anconeus muscle
Brachioradialis muscle
Extensor carpi radialis longus muscle
Supinator muscle
Extensor carpi radialis brevis muscle
Extensor carpi ulnaris muscle
Extensor digitorum muscle and extensor digiti minimi muscle
Extensor indicis muscle
Extensor pollicis longus muscle
Abductor pollicis longus muscle
Extensor pollicis brevis muscle
Posterior interosseous nerve (continuation of deep branch of radial nerve distal to inferior border of supinator muscle)
Superficial branch of radial nerve
Dorsal digital branches


From axillary nerve
Superior lateral brachial cutaneous nerve
From radial nerve
Inferior lateral brachial cutaneous nerve
Posterior brachial cutaneous nerve
Posterior antebrachial cutaneous nerve
Superficial branch of radial nerve and dorsal digital branches

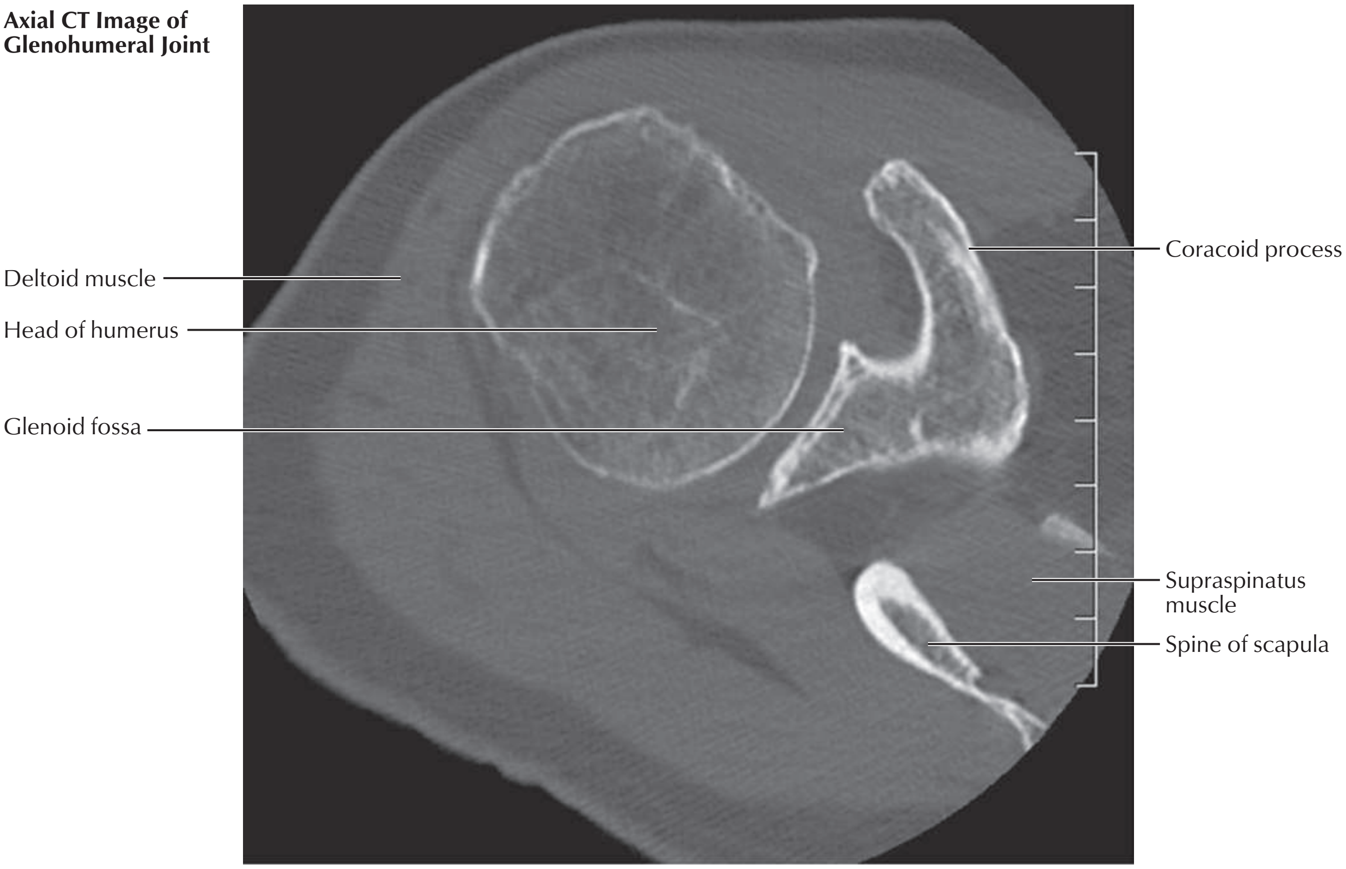
Cutaneous innervation from radial and axillary nerves

See also Plates 245, 412

Coronal Proton-Density MRI of Glenohumeral Joint


Clavicle
Acromion
Supraspinatus muscle
Supraspinatus tendon
Glenoid labrum
Head of humerus
Glenoid labrum
Surgical neck
Humerus

Axial CT Image of Glenohumeral Joint


Coracoid process
Deltoid muscle
Head of humerus
Glenoid fossa
Supraspinatus muscle
Spine of scapula

ANATOMICAL STRUCTURES	CLINICAL IMPORTANCE	PLATE NUMBERS
SKELETAL SYSTEM		
Clavicle	Most clavicular fractures are caused from a fall on an outstretched arm or direct trauma delivered to the lateral side of the shoulder. Middle third of the clavicle is most commonly fractured due to the changing bony morphology of the clavicle, its strutlike function, and ligament attachments.	408, 409
Humerus	The proximal humerus, especially the surgical neck, is fractured due to low-energy falls in the elderly and high-energy trauma in youth. The axillary nerve is in harm's way and the circumflex humeral arteries can be injured. Midshaft fractures are also relatively common and place the radial nerve in harm's way.	409–411
Ulna	Subcutaneous location of olecranon makes it vulnerable to fracture by direct trauma, especially when elbow is flexed; ulnar styloid process may also be fractured in distal radial fractures	426, 429
Radius	Fractures of distal radius are most common fracture of upper extremity, typically caused by fall on outstretched hand	429
Scaphoid	Most commonly fractured carpal bone; fracture is often due to fall on outstretched hand	439, 440, 442
MUSCULAR SYSTEM		
Rotator (compressor) cuff muscles	Injuries to this group of muscles can be from an acute injury or chronic overuse injury leading to common causes of shoulder pain and disability	412, 415, 422
Supraspinatus tendon	Most commonly injured rotator (compressor) cuff muscle tendon complex. Often torn beneath the acromion	415–417, 422
Biceps brachii tendon	Proximally the long head of the biceps tendon tears in the elderly from falls on an outstretched arm, and distally the biceps tendon is used to perform flexor compartment reflex assessing the C5 and C6 spinal nerves	421, 423
Long head of biceps brachii	When long head has been ruptured, it pulls off supraglenoid tubercle and retracts down into arm; muscle bulges (Popeye deformity) at midshaft of humerus	421
Posterior forearm muscles	Repetitive use of muscles arising from common extensor origin can damage tendons and produce pain over lateral epicondyle, associated with tennis elbow	431
Anterior forearm muscles	Repetitive use of muscles arising from common flexor origin can damage tendons and produce pain over medial epicondyle, associated with golfer's elbow	432, 433
NERVOUS SYSTEM		
Long thoracic nerve	Injury may produce "winged scapula" caused by denervation of serratus anterior	417, 419
Axillary nerve	Position of nerve close to medial aspect of humeral head makes it vulnerable to injury with fractures of surgical neck of humerus or humeral dislocations	422
Median nerve	Commonly compressed in carpal tunnel, producing pain and paresthesia in lateral three and one-half digits	450, 466
Recurrent branch of median nerve	May be injured in superficial lacerations of palm over thenar eminence	449
Ulnar nerve	Vulnerable to compression or injury where it passes posterior to medial epicondyle of humerus, and at wrist in ulnar tunnel (Guyon's canal)	463, 467
Radial nerve	Vulnerable to compression or injury where it lies against humerus in radial groove (e.g., with humeral fracture); common symptom is "wrist drop" due to weakness of wrist extensors	468, 469

ANATOMICAL STRUCTURES	CLINICAL IMPORTANCE	PLATE NUMBERS
CARDIOVASCULAR SYSTEM		
Median cubital vein	Accessed in cubital fossa for venipuncture	405
Suprascapular, dorsal scapular, and circumflex scapular arteries	Provide collateral circulation around scapula, allowing blood to reach distal part of upper extremity if axillary artery is blocked or compressed	418
Brachial artery	Palpated in cubital fossa to assess brachial pulse prior to taking blood pressure measurement	423, 424
Radial artery	Palpated at lateral aspect of wrist to assess radial pulse	424

*Selections were based largely on clinical data as well as commonly covered clinical correlations in gross anatomy courses.

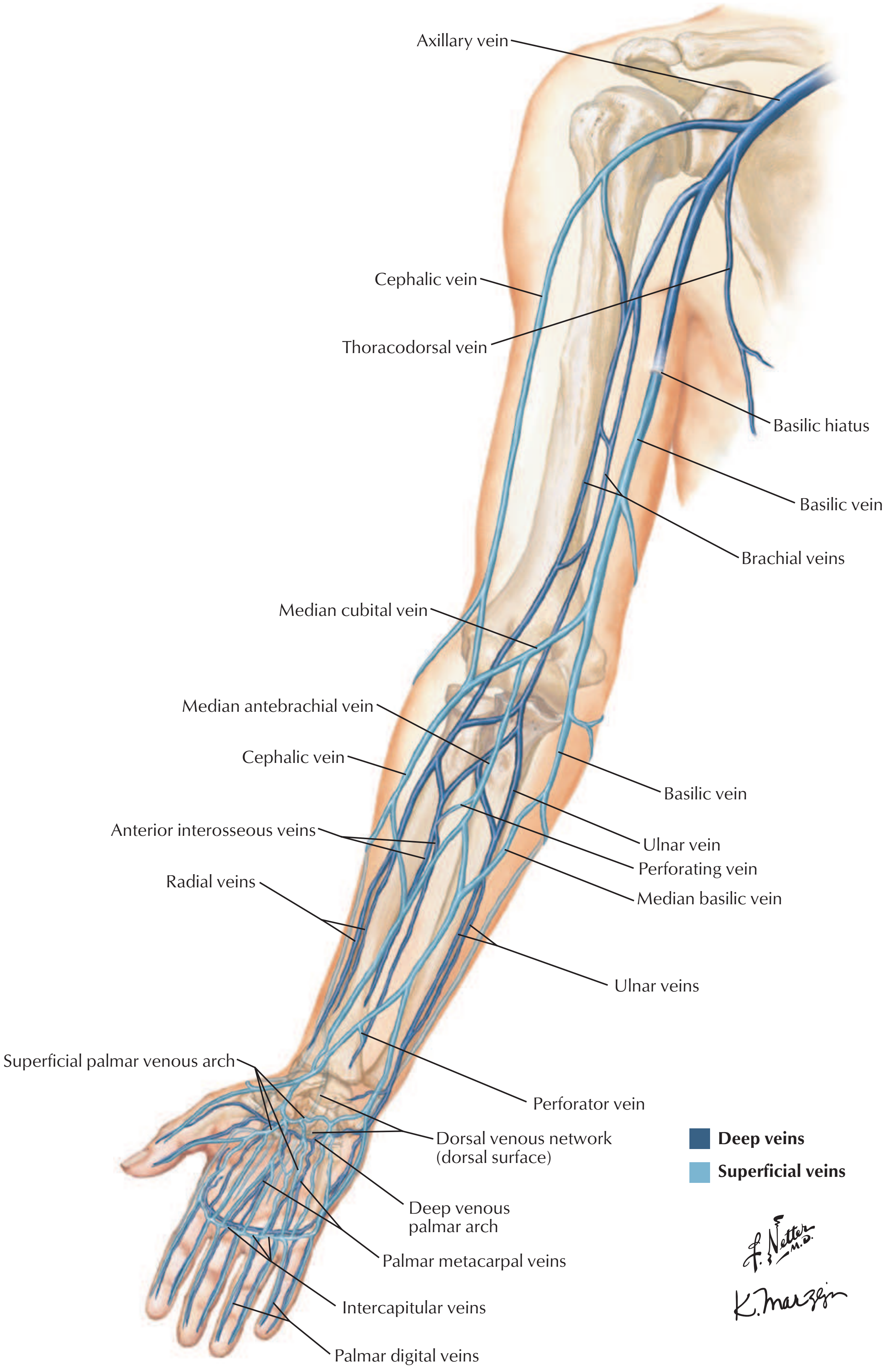
MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Abductor digiti minimi	Hand	Pisiform bone and tendon of flexor carpi ulnaris	Medial side of base of proximal phalanx of little finger (5th digit)	Ulnar nerve (deep branch)	Deep palmar branch of ulnar artery	Abducts little finger
Abductor pollicis brevis	Hand	Flexor retinaculum, tubercles of scaphoid and trapezium bones	Base of proximal phalanx of thumb	Median nerve (recurrent branch)	Superficial palmar branch of radial artery	Abducts thumb
Abductor pollicis longus	Posterior forearm	Posterior surface of ulna, radius, and interosseous membrane	Base of 1st metacarpal	Radial nerve (posterior interosseous)	Posterior interosseous artery	Abducts and extends thumb at carpometacarpal joint
Adductor pollicis	Hand	*Oblique head*: bases of 2nd and 3rd metacarpals and capitate bone and adjacent bones *Transverse head:* anterior surface of 3rd metacarpal	Base of proximal phalanx of thumb	Ulnar nerve (deep branch)	Deep palmar arch	Adducts thumb
Anconeus	Arm	Posterior surface of lateral epicondyle of humerus	Lateral surface of olecranon and posterior proximal ulna	Radial nerve	Deep brachial artery	Assists triceps brachii in extending elbow, abducts ulna in pronation
Biceps brachii	Arm	*Long head:* supraglenoid tubercle of scapula *Short head:* coracoid process of scapula	Radial tuberosity, fascia of forearm via bicipital aponeurosis	Musculocutaneous nerve	Muscular branches of brachial artery	Flexes and supinates forearm at elbow
Brachialis	Arm	Distal half of anterior surface of humerus	Coronoid process and tuberosity of ulna	Musculocutaneous nerve and radial nerve	Radial recurrent artery, muscular branches of brachial artery	Flexes forearm at elbow
Brachioradialis	Posterior forearm	Proximal 2/3 of lateral supracondylar ridge of humerus	Lateral side of distal end of radius	Radial nerve	Radial recurrent artery	Weak flexion of forearm when forearm is midpronated
Coracobrachialis	Arm	Coracoid process of scapula	Middle third of medial surface of humerus	Musculocutaneous nerve	Muscular branches of brachial artery	Flexes and adducts arm at shoulder
Deltoid	Shoulder	Lateral third of clavicle, acromion, spine of scapula	Deltoid tuberosity of humerus	Axillary nerve	Posterior circumflex humeral artery, deltoid branch of thoracoacromial artery	*Clavicular part*: flexes and medially rotates arm *Acromial part:* abducts arm beyond initial 15 degrees done by supraspinatus *Spinous part:* extends and laterally rotates arm
Dorsal interosseous muscles	Hand	Sides of two adjacent metacarpal bones	Base of proximal phalangeal bones, extensor expansion of digits 2–4	Ulnar nerve (deep branch)	Deep palmar arch	Abduct digits; flex digits at metacarpophalangeal joint and extend interphalangeal joints
Extensor carpi radialis brevis	Posterior forearm	Lateral epicondyle of humerus	Base of 3rd metacarpal and slip to 2nd metacarpal	Radial nerve (deep branch)	Radial artery, radial recurrent artery	Extends and abducts hand at wrist
Extensor carpi radialis longus	Posterior forearm	Distal third of lateral supracondylar ridge of humerus	Base of 2nd metacarpal and slip to 3rd metacarpal	Radial nerve	Radial artery, radial recurrent artery	Extends and abducts hand at wrist
Extensor carpi ulnaris	Posterior forearm	Lateral epicondyle of humerus and posterior border of ulna	Base of 5th metacarpal	Radial nerve (posterior interosseous nerve)	Posterior interosseous artery	Extends and adducts hand at wrist

Variations in spinal nerve contributions to the innervation of muscles, their arterial supply, their attachments, and their actions are common themes in human anatomy. Therefore, expect differences between texts and realize that anatomical variation is normal.

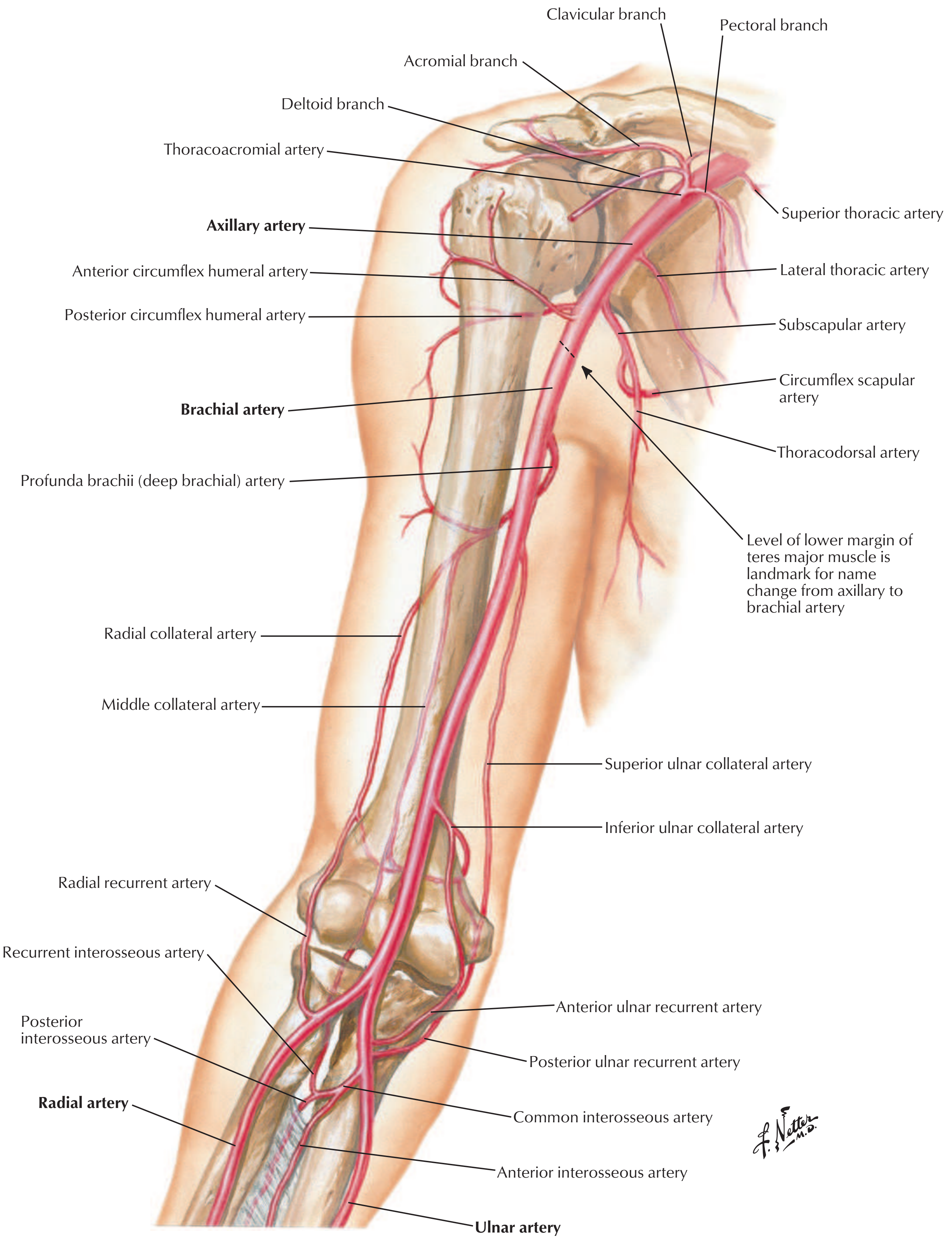
MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Extensor digiti minimi	Posterior forearm	Lateral epicondyle of humerus	Extensor expansion of 5th digit	Radial nerve (posterior interosseous nerve)	Posterior interosseous artery	Extends 5th digit
Extensor digitorum	Posterior forearm	Lateral epicondyle of humerus	Extensor expansions of medial four digits	Radial nerve (posterior interosseous nerve)	Posterior interosseous artery	Extends medial four digits, assists in wrist extension
Extensor indicis	Posterior forearm	Posterior surface of ulna and interosseous membrane	Extensor expansion of 2nd digit	Radial nerve (posterior interosseous nerve)	Posterior interosseous artery	Extends 2nd digit and helps extend hand at wrist
Extensor pollicis brevis	Posterior forearm	Posterior surface of radius and interosseous membrane	Dorsal base of proximal phalanx of thumb	Radial nerve (posterior interosseous nerve)	Posterior interosseous artery	Extends proximal phalanx of thumb at carpometacarpal joint
Extensor pollicis longus	Posterior forearm	Posterior surface of middle third of ulna, interosseous membrane	Dorsal base of distal phalanx of thumb	Radial nerve (posterior interosseous nerve)	Posterior interosseous artery	Extends distal phalanx of thumb at interphalangeal and metacarpophalangeal joints
Flexor carpi radialis	Anterior forearm	Medial epicondyle of humerus	Base of 2nd metacarpal	Median nerve	Radial artery	Flexes and abducts hand at wrist
Flexor carpi ulnaris	Anterior forearm	*Superficial head:* medial epicondyle of humerus *Deep head:* olecranon and posterior border of ulna	Pisiform bone, hook of hamate bone, base of 5th metacarpal	Ulnar nerve	Posterior ulnar recurrent artery	Flexes and adducts hand at wrist
Flexor digiti minimi brevis	Hand	Flexor retinaculum and hook of hamate bone	Medial side of base of proximal phalanx of little finger	Ulnar nerve (deep branch)	Deep palmar branch of ulnar artery	Flexes proximal phalanx of little finger
Flexor digitorum profundus	Anterior forearm	Medial and anterior surface of proximal 3/4 of ulna and interosseous membrane	Palmar base of distal phalangeal bones of medial four digits	*Medial part:* ulnar nerve *Lateral part:* median nerve	Anterior interosseous artery, muscular branches of ulnar artery	Flexes distal phalangeal bones of medial four digits, assists with flexion of hand at wrist
Flexor digitorum superficialis	Anterior forearm	*Humeroulnar head:* medial epicondyle of humerus, coronoid, process of ulna, ulnar collateral ligament *Radial head:* superior half of anterior radius	Bodies of middle phalangeal bones of medial four digits	Median nerve	Ulnar and radial arteries	Flexes middle and proximal phalangeal bones of medial four digits, flexes hand at wrist
Flexor pollicis brevis	Hand	Flexor retinaculum and tubercle of trapezium bone	Lateral side of base of proximal phalanx of thumb	Median nerve (recurrent branch)	Superficial palmar branch of radial artery	Flexes proximal phalanx of thumb
Flexor pollicis longus	Anterior forearm	Anterior surface of radius and interosseous membrane	Palmar base of distal phalanx of thumb	Median nerve (anterior interosseous nerve)	Anterior interosseous artery	Flexes phalangeal bones of thumb
Infraspinatus	Shoulder	Infraspinous fossa of scapula and deep fascia	Greater tubercle of humerus	Suprascapular nerve	Suprascapular artery	Lateral rotation of arm
Latissimus dorsi	Shoulder	Spinous processes of T7–L5, thoracolumbar fascia, iliac crest, and last three ribs	Intertubercular sulcus of humerus	Thoracodorsal nerve	Thoracodorsal artery, dorsal perforating branches of 9th, 10th, and 11th posterior intercostal, subcostal, and first three lumbar arteries	Extends, adducts, and medially rotates humerus
Levator scapulae	Superficial back	Posterior tubercles of transverse processes of C1–C4	Medial border of scapula from superior angle to spine	Anterior rami of C3–C4 and dorsal scapular nerve	Dorsal scapular artery, transverse cervical artery, ascending cervical artery	Elevates scapula medially, inferiorly rotates glenoid fossa
Lumbrical, first and second	Hand	Lateral two tendons of flexor digitorum profundus	Lateral sides of extensor expansion of digits 2 and 3	Median nerve (digital branches)	Superficial and deep palmar arches	Extend digits at interphalangeal joints, flex metacarpophalangeal joints

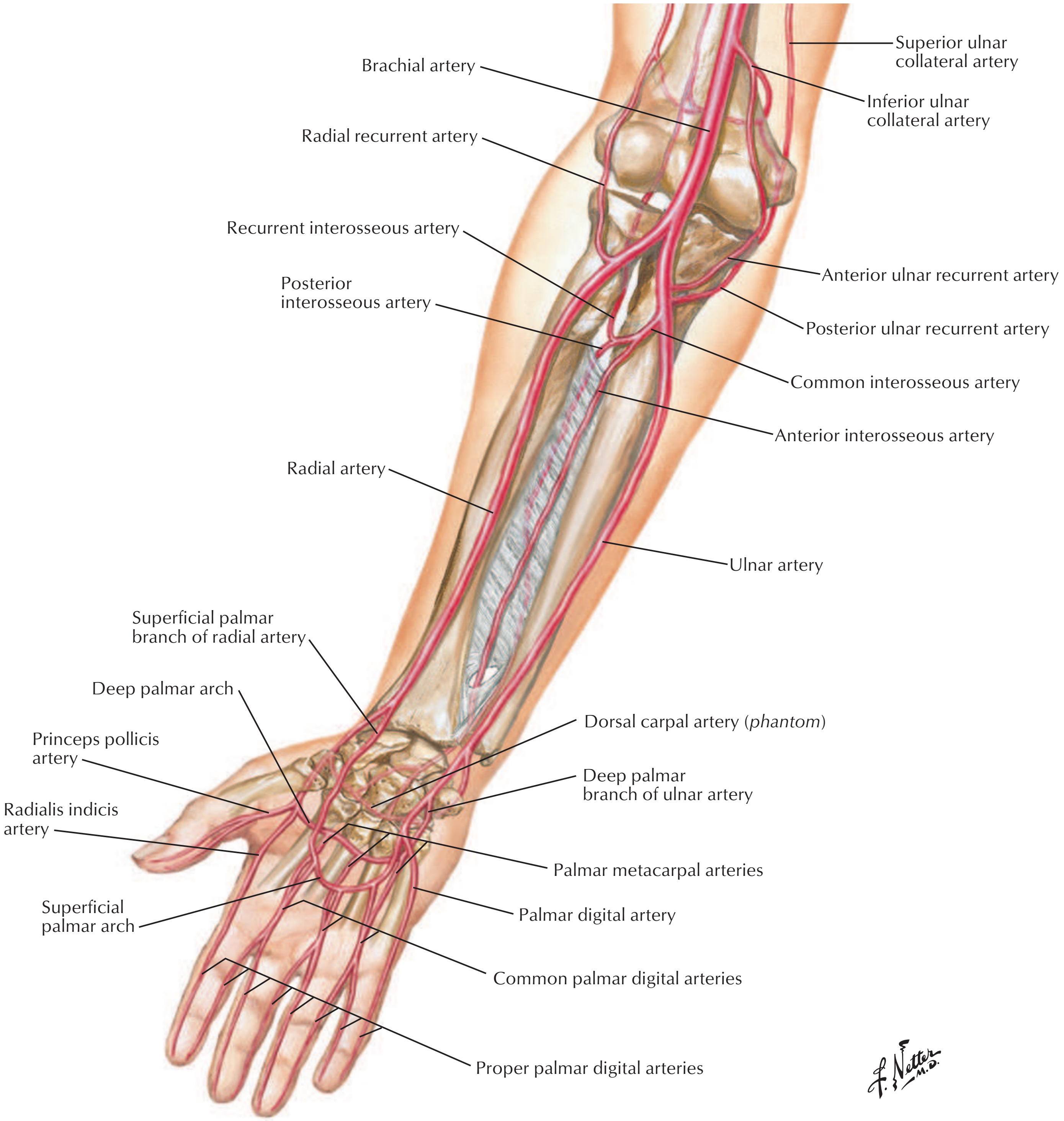
MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Lumbrical, third and fourth	Hand	Medial three tendons of flexor digitorum profundus	Lateral sides of extensor expansion of digits 4 and 5	Ulnar nerve (deep branch)	Superficial and deep palmar arches	Extend digits at interphalangeal joints, flex metacarpophalangeal joints
Opponens digiti minimi	Hand	Flexor retinaculum and hook of hamate bone	Palmar surface of 5th metacarpal	Ulnar nerve (deep branch)	Deep palmar branch of ulnar artery	Draws 5th metacarpal anteriorly and rotates it to face thumb
Opponens pollicis	Hand	Flexor retinaculum and tubercle of trapezium bone	Lateral side of 1st metacarpal	Median nerve (recurrent branch)	Superficial palmar branch of radial artery	Draws 1st metacarpal forward and rotates it medially
Palmar interosseous muscles	Hand	Sides of metacarpal bones 2, 4, and 5	Bases of proximal phalanx and extensor expansion of digits 2, 4, and 5	Ulnar nerve (deep branch)	Deep palmar arch	Adducts digits; flexes digits and extends interphalangeal joints
Palmaris brevis	Hand	Palmar aponeurosis and flexor retinaculum	Skin of medial border of palm	Superficial branch of ulnar nerve	Superficial palmar arch	Deepens hollow of hand, assists grip
Palmaris longus	Anterior forearm	Medial epicondyle of humerus	Distal half of flexor retinaculum and palmar aponeurosis	Median nerve	Posterior ulnar recurrent artery	Flexes hand at wrist and tenses palmar aponeurosis
Pectoralis major	Pectoral/ axillary regions	Sternal half of clavicle, sternum to 7th rib, cartilages of true ribs, aponeurosis of external abdominal oblique muscle	Lateral lip of intertubercular sulcus of humerus	Medial and lateral pectoral nerves	Pectoral branch of thoracoacromial artery, perforating branches of internal thoracic artery	Flexes, adducts, and medially rotates arm
Pectoralis minor	Pectoral/ axillary regions	Outer surface of upper margin of ribs 3–5	Coracoid process of scapula	Medial pectoral nerve	Pectoral branch of thoracoacromial artery, and superior and lateral thoracic arteries	Lowers lateral angle of scapula and protracts scapula
Pronator quadratus	Anterior forearm	Distal fourth of anterior ulna	Distal fourth of anterior radius	Median nerve (anterior interosseous nerve)	Anterior interosseous artery	Pronates forearm
Pronator teres	Anterior forearm	Two heads: medial epicondyle of humerus and coronoid process of ulna	Midway along lateral surface of radius	Median nerve	Anterior ulnar recurrent artery	Pronates forearm and weakly flexes elbow
Rhomboid major	Superficial back	Spinous processes of T2–T5 vertebrae	Medial border of scapula below base of spine of scapula	Dorsal scapular nerve	Dorsal scapular OR deep branch of transverse cervical artery, dorsal perforating branches of upper five or six posterior intercostal arteries	Fixes scapula to thoracic wall and retracts and rotates it to depress glenoid cavity
Rhomboid minor	Superficial back	Nuchal ligament, spines of C7 and T1 vertebrae	Medial border of scapula at spine of scapula	Dorsal scapular nerve	Dorsal scapular artery OR deep branch of transverse cervical artery, dorsal perforating branches of upper five or six posterior intercostal arteries	Fixes scapula to thoracic wall and retracts and rotates it to depress glenoid cavity
Serratus anterior	Shoulder	Lateral surfaces of upper 8–9 ribs	Costal surface of medial border of scapula	Long thoracic nerve	Lateral thoracic artery	Protracts and rotates scapula and holds it against thoracic wall
Subclavius	Shoulder	Upper border of 1st rib and its cartilage	Inferior surface of middle third of clavicle	Nerve to subclavius	Clavicular branch of thoracoacromial artery	Anchors and depresses clavicle

MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Subscapularis	Shoulder	Subscapular fossa	Lesser tubercle of humerus	Upper and lower subscapular nerves	Subscapular artery, lateral thoracic artery	Medially rotates and adducts arm; helps hold humeral head in glenoid fossa
Supinator	Posterior forearm	Lateral epicondyle of humerus, radial collateral and anular ligaments, supinator fossa, and crest of ulna	Lateral, posterior, and anterior surfaces of proximal third of radius	Radial nerve (deep branch)	Radial recurrent artery, posterior interosseous arteries	Supinates forearm
Supraspinatus	Shoulder	Supraspinous fossa of scapula and deep fascia	Greater tubercle of humerus	Suprascapular nerve	Suprascapular artery	Initiates arm abduction
Teres major	Shoulder	Posterior surface of inferior angle of scapula	Medial lip of intertubercular sulcus of humerus	Lower subscapular nerve	Circumflex scapular artery	Adducts and medially rotates arm
Teres minor	Shoulder	Upper 2/3 of posterior surface of lateral border of scapula	Inferior facet of greater tubercle of humerus	Axillary nerve	Circumflex scapular artery	Laterally rotates arm
Trapezius	Superficial back	Superior nuchal line, external occipital protuberance, nuchal ligament, spinous processes of C7–T12	Lateral third of clavicle, acromion, and spine of scapula	Accessory nerve (cranial nerve XI)	Transverse cervical artery, dorsal perforating branches of posterior intercostal arteries	Elevates, retracts, and rotates scapula; lower fibers depress scapula
Triceps brachii	Arm	*Long head:* infraglenoid tubercle of scapula *Lateral head:* upper half of posterior humerus *Medial head:* distal 2/3 of medial and posterior humerus	Posterior surface of olecranon process of ulna	Radial nerve	Branch of profunda brachii artery	Extends forearm at elbow; long head stabilizes head of abducted humerus and extends and adducts arm


Axillary vein
Cephalic vein
Thoracodorsal vein
Basilic hiatus
Basilic vein
Brachial veins
Median cubital vein
Median antebrachial vein
Cephalic vein
Basilic vein
Anterior interosseous veins
Ulnar vein
Perforating vein
Radial veins
Median basilic vein
Ulnar veins
Superficial palmar venous arch
Perforator vein
Dorsal venous network (dorsal surface)
Deep venous palmar arch
Palmar metacarpal veins
Intercapitular veins
Palmar digital veins
■ Deep veins
■ Superficial veins
F. Netter M.D.
K. Marzejon

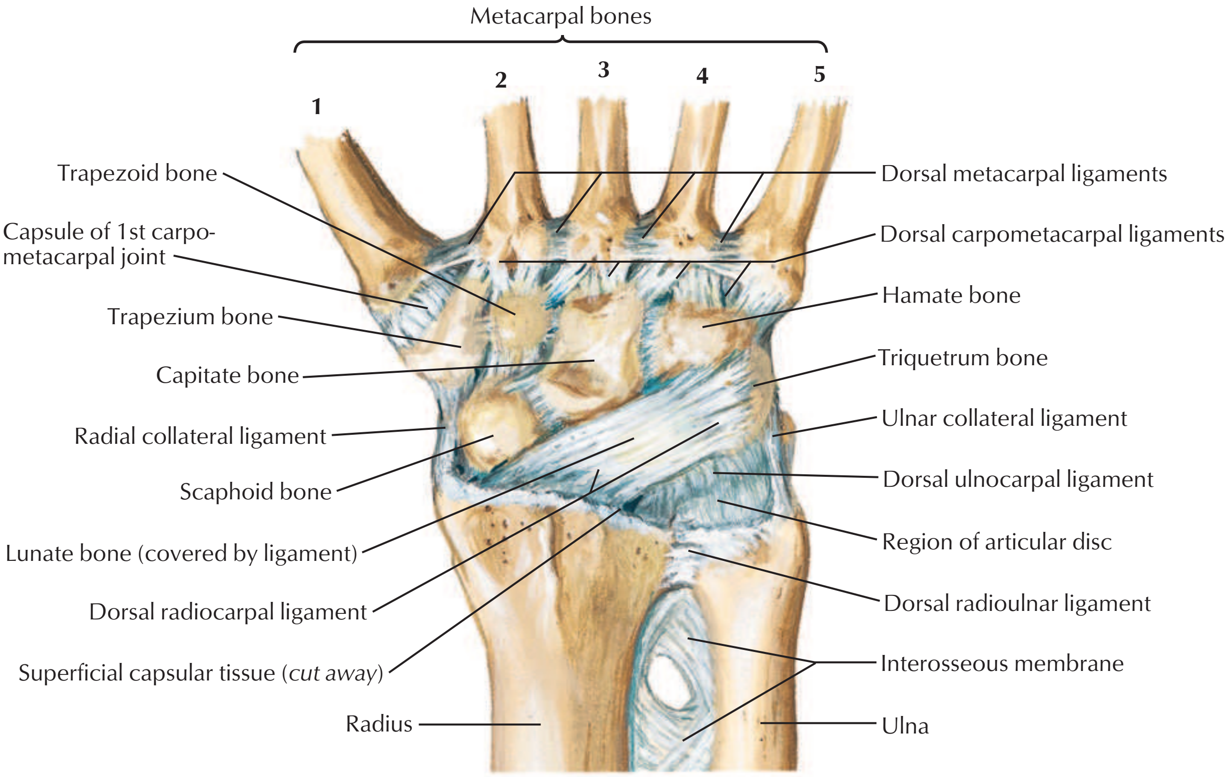
Arteries of Arm and Proximal Forearm


Clavicular branch
Pectoral branch
Acromial branch
Deltoid branch
Thoracoacromial artery
Superior thoracic artery
Axillary artery
Lateral thoracic artery
Anterior circumflex humeral artery
Posterior circumflex humeral artery
Subscapular artery
Circumflex scapular artery
Brachial artery
Thoracodorsal artery
Profunda brachii (deep brachial) artery
Level of lower margin of teres major muscle is landmark for name change from axillary to brachial artery
Radial collateral artery
Middle collateral artery
Superior ulnar collateral artery
Inferior ulnar collateral artery
Radial recurrent artery
Recurrent interosseous artery
Anterior ulnar recurrent artery
Posterior interosseous artery
Posterior ulnar recurrent artery
Radial artery
Common interosseous artery
Anterior interosseous artery
Ulnar artery
F. Netter M.D.

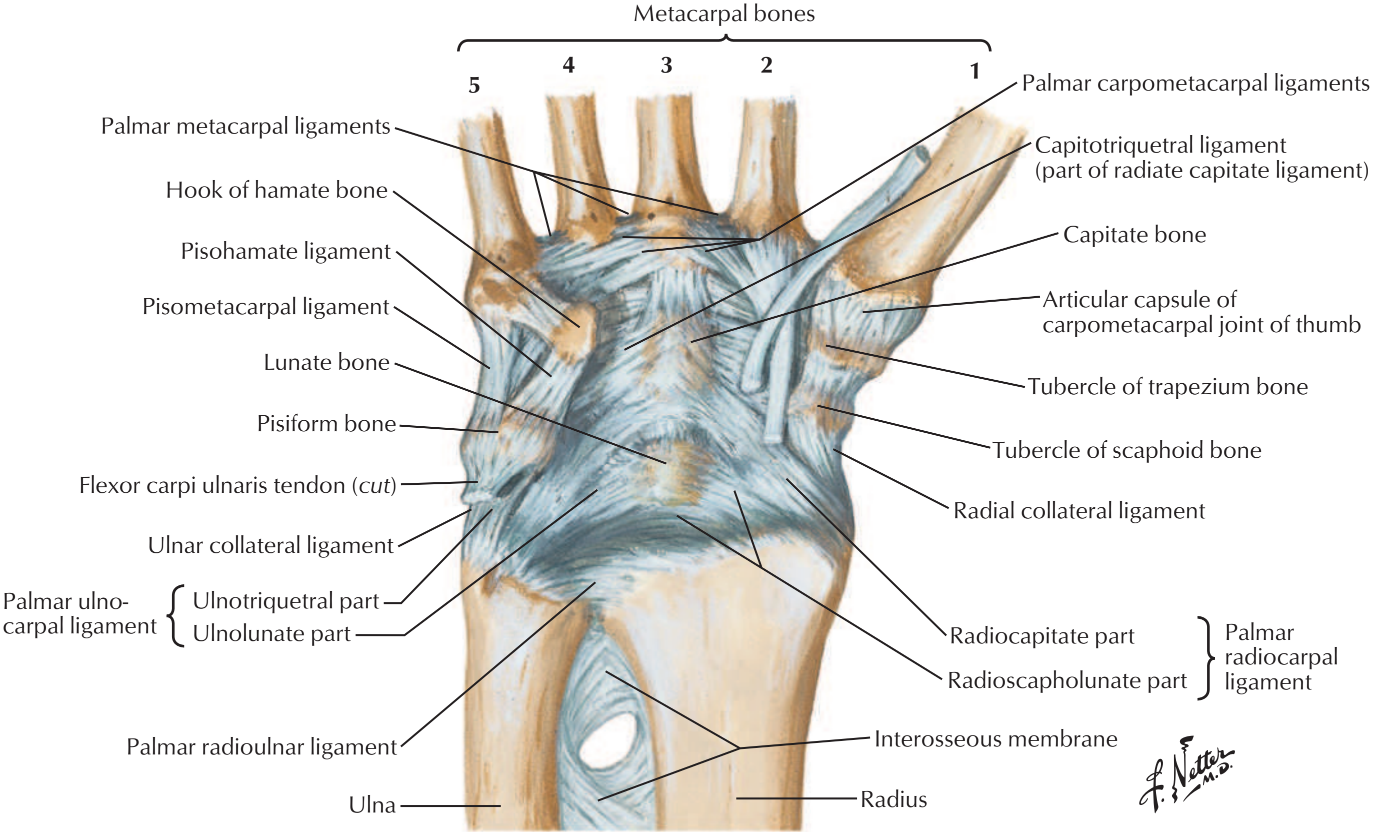

Brachial artery
Radial recurrent artery
Recurrent interosseous artery
Posterior interosseous artery
Radial artery
Superficial palmar branch of radial artery
Deep palmar arch
Princeps pollicis artery
Radialis indicis artery
Superficial palmar arch
Superior ulnar collateral artery
Inferior ulnar collateral artery
Anterior ulnar recurrent artery
Posterior ulnar recurrent artery
Common interosseous artery
Anterior interosseous artery
Ulnar artery
Dorsal carpal artery (*phantom*)
Deep palmar branch of ulnar artery
Palmar metacarpal arteries
Palmar digital artery
Common palmar digital arteries
Proper palmar digital arteries
F. Netter M.D.

Ligaments of Wrist

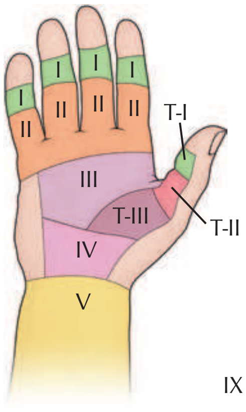
Posterior (dorsal) view

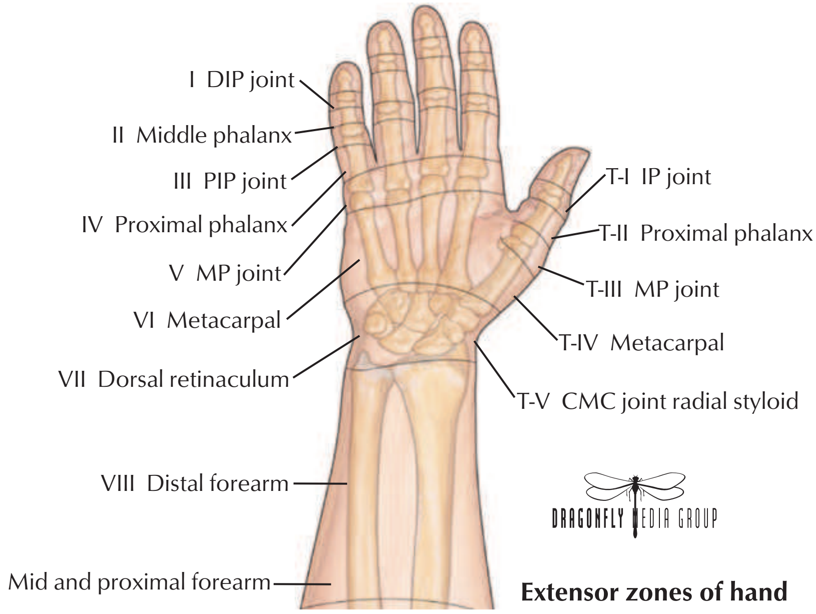

Metacarpal bones
1
2
3
4
5
Trapezoid bone
Capsule of 1st carpo-metacarpal joint
Trapezium bone
Capitate bone
Radial collateral ligament
Scaphoid bone
Lunate bone (covered by ligament)
Dorsal radiocarpal ligament
Superficial capsular tissue (*cut away*)
Radius
Dorsal metacarpal ligaments
Dorsal carpometacarpal ligaments
Hamate bone
Triquetrum bone
Ulnar collateral ligament
Dorsal ulnocarpal ligament
Region of articular disc
Dorsal radioulnar ligament
Interosseous membrane
Ulna

Flexor retinaculum removed: palmar view

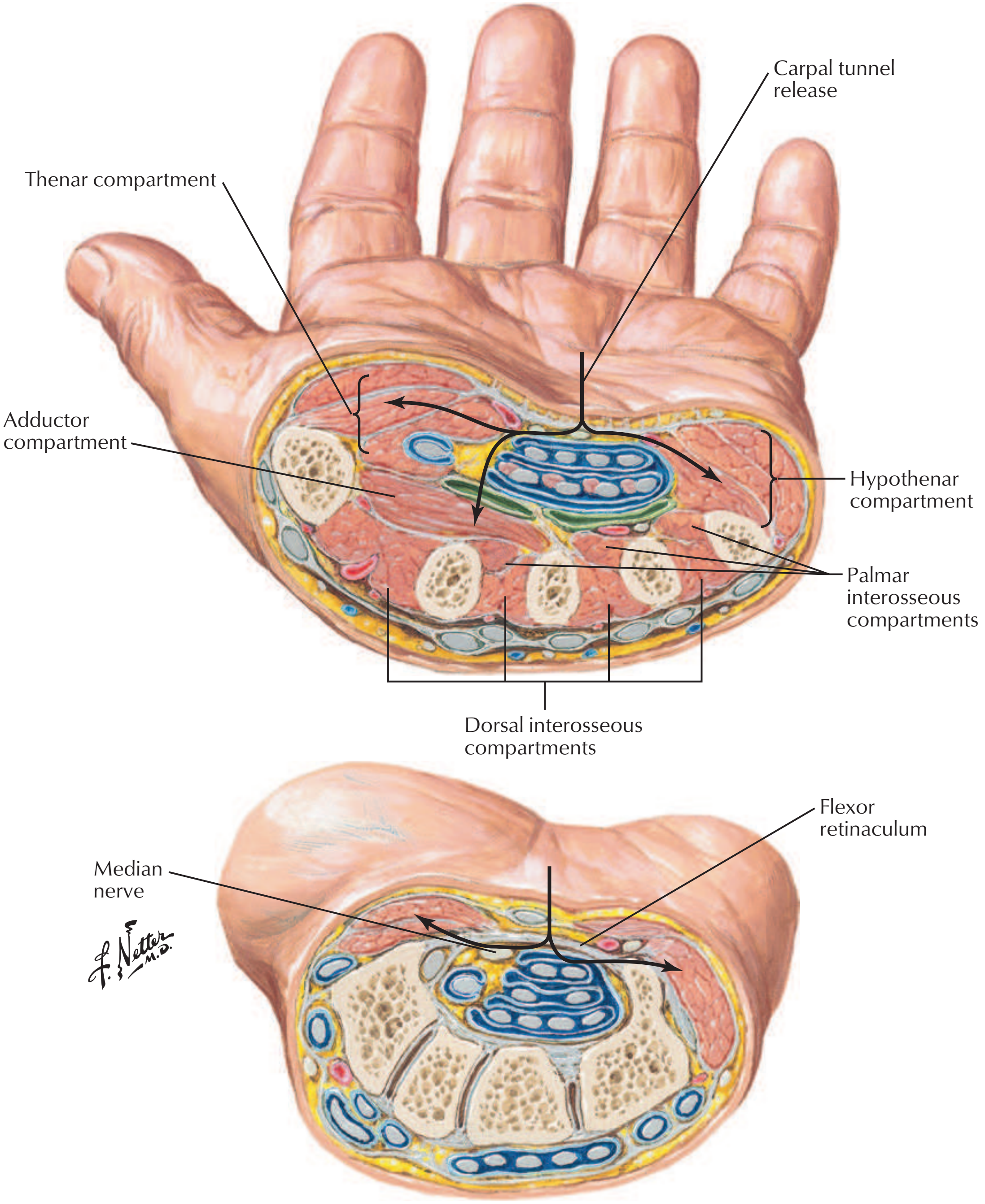

Metacarpal bones
5
4
3
2
1
Palmar metacarpal ligaments
Hook of hamate bone
Pisohamate ligament
Pisometacarpal ligament
Lunate bone
Pisiform bone
Flexor carpi ulnaris tendon (*cut*)
Ulnar collateral ligament
Palmar ulno-carpal ligament
Ulnotriquetral part
Ulnolunate part
Palmar radioulnar ligament
Ulna
Palmar carpometacarpal ligaments
Capitotriquetral ligament (part of radiate capitate ligament)
Capitate bone
Articular capsule of carpometacarpal joint of thumb
Tubercle of trapezium bone
Tubercle of scaphoid bone
Radial collateral ligament
Radiocapitate part
Radioscapholunate part
Palmar radiocarpal ligament
Interosseous membrane
Radius

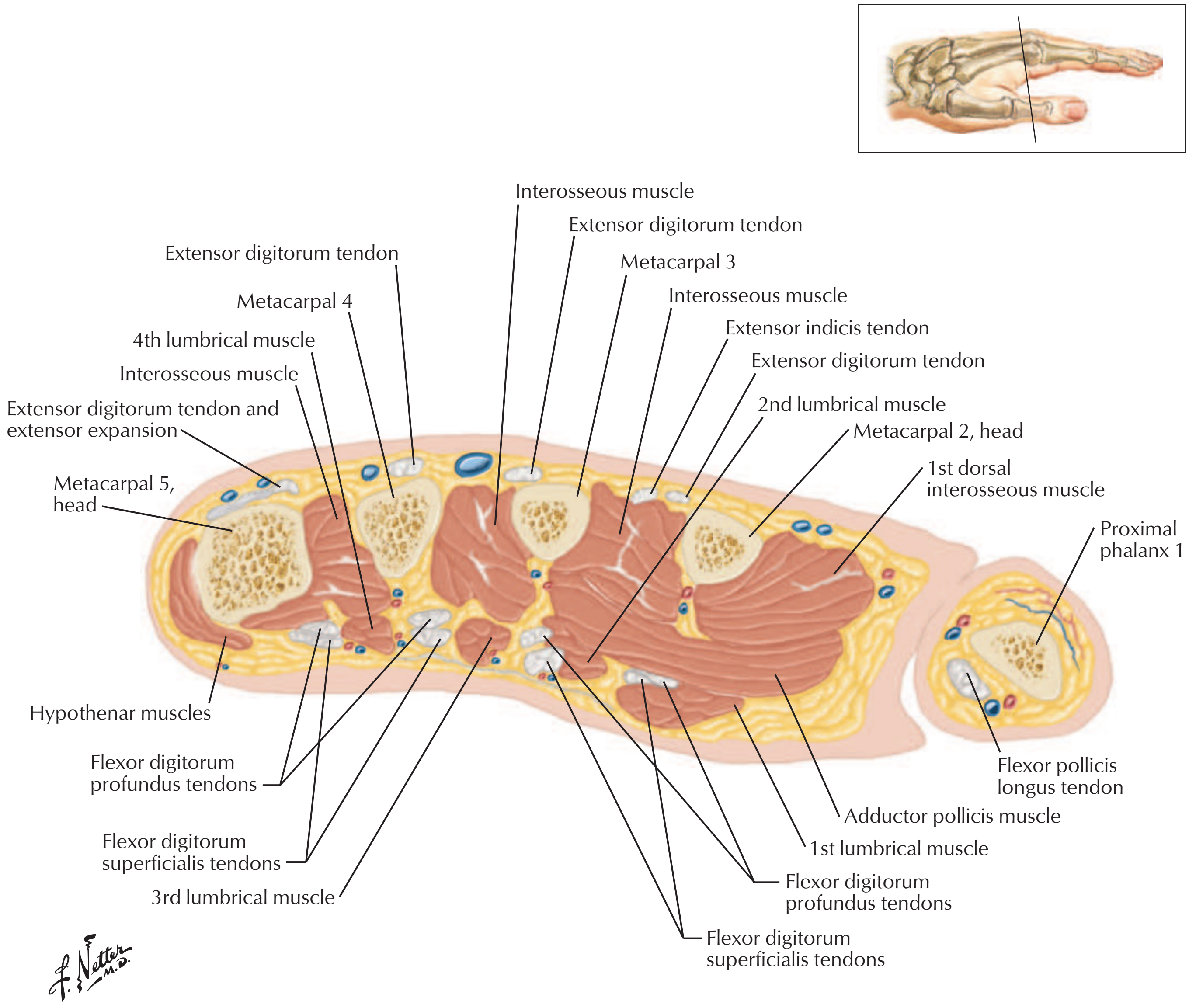
Flexor zones of hand

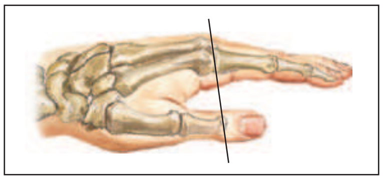

I
I
I
I
II
II
II
II
T-I
III
T-III
T-II
IV
V

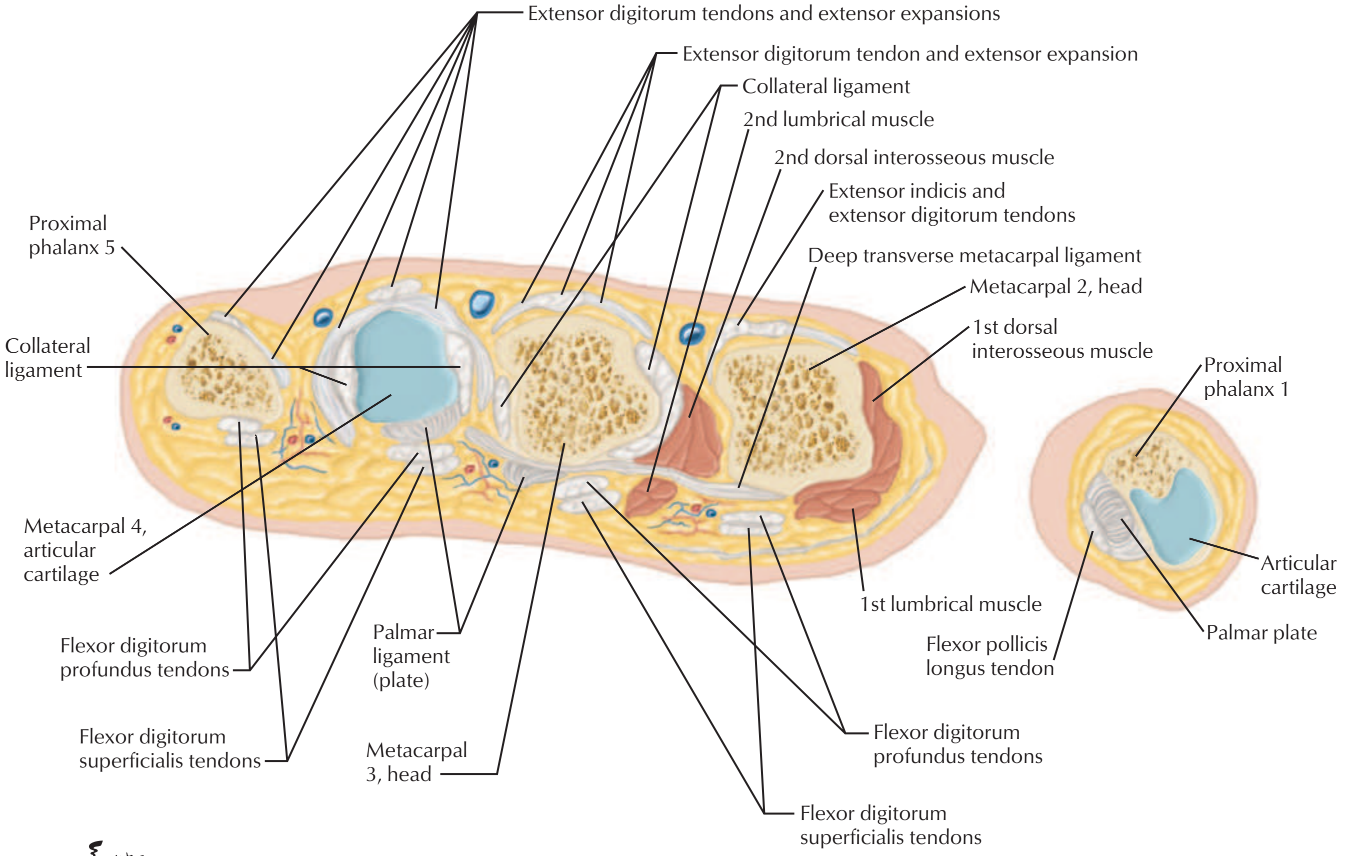

I DIP joint
II Middle phalanx
III PIP joint
IV Proximal phalanx
V MP joint
VI Metacarpal
VII Dorsal retinaculum
VIII Distal forearm
IX Mid and proximal forearm
T-I IP joint
T-II Proximal phalanx
T-III MP joint
T-IV Metacarpal
T-V CMC joint radial styloid

Extensor zones of hand


Carpal tunnel release
Thenar compartment
Adductor compartment
Hypothenar compartment
Palmar interosseous compartments
Dorsal interosseous compartments
Flexor retinaculum
Median nerve


Interosseous muscle
Extensor digitorum tendon
Metacarpal 3
Interosseous muscle
Extensor indicis tendon
Extensor digitorum tendon
2nd lumbrical muscle
Metacarpal 2, head
1st dorsal interosseous muscle
Proximal phalanx 1
Extensor digitorum tendon
Metacarpal 4
4th lumbrical muscle
Interosseous muscle
Extensor digitorum tendon and extensor expansion
Metacarpal 5, head
Hypothenar muscles
Flexor digitorum profundus tendons
Flexor digitorum superficialis tendons
3rd lumbrical muscle
Flexor pollicis longus tendon
Adductor pollicis muscle
1st lumbrical muscle
Flexor digitorum profundus tendons
Flexor digitorum superficialis tendons
F. Netter M.D.




Extensor digitorum tendons and extensor expansions
Extensor digitorum tendon and extensor expansion
Collateral ligament
2nd lumbrical muscle
2nd dorsal interosseous muscle
Extensor indicis and extensor digitorum tendons
Deep transverse metacarpal ligament
Metacarpal 2, head
1st dorsal interosseous muscle
Proximal phalanx 1
Proximal phalanx 5
Collateral ligament
Metacarpal 4, articular cartilage
Flexor digitorum profundus tendons
Flexor digitorum superficialis tendons
Palmar ligament (plate)
Metacarpal 3, head
1st lumbrical muscle
Flexor pollicis longus tendon
Articular cartilage
Palmar plate
Flexor digitorum profundus tendons
Flexor digitorum superficialis tendons

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LOWER LIMB

8

Surface Anatomy 471
Cutaneous Anatomy 472-475
Hip and Thigh 476-496
Knee 497-503
Leg 504-514
Ankle and Foot 515-528
Neurovasculature 529-533
Regional Imaging 534-535
Structures with High Clinical Significance Tables 8.1-8.2
Muscle Tables Tables 8.3-8.6
Electronic Bonus Plates BP107-BP117

ELECTRONIC BONUS PLATES

BP107 Veins of Lower Limb

BP108 Arteries of Thigh and Knee

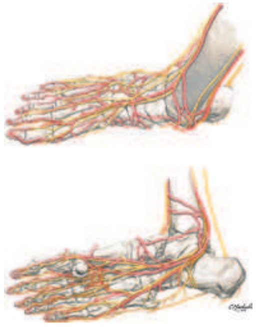
BP109 Cross-Sectional Anatomy of Hip: Axial View

BP110 Arteries of Knee and Foot

BP111 Leg: Serial Cross Sections

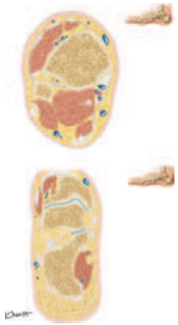
BP112 Osteology of Knee

BP113 Knee Radiograph: Lateral View

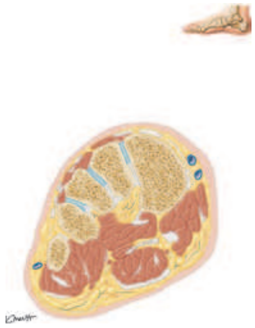


BP114 Anatomy of Foot: Nerves and Arteries

ELECTRONIC BONUS PLATES—*cont'd*



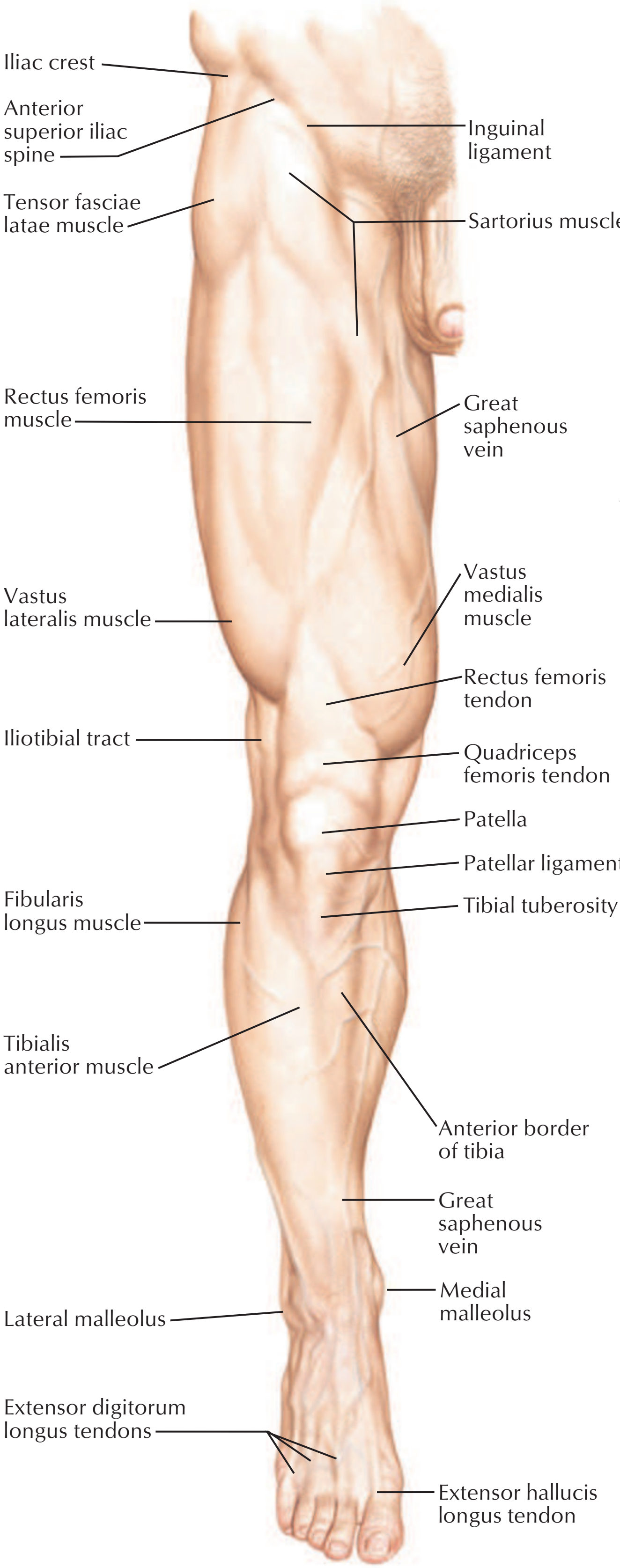
BP115 Cross-Sectional Anatomy of Ankle and Foot



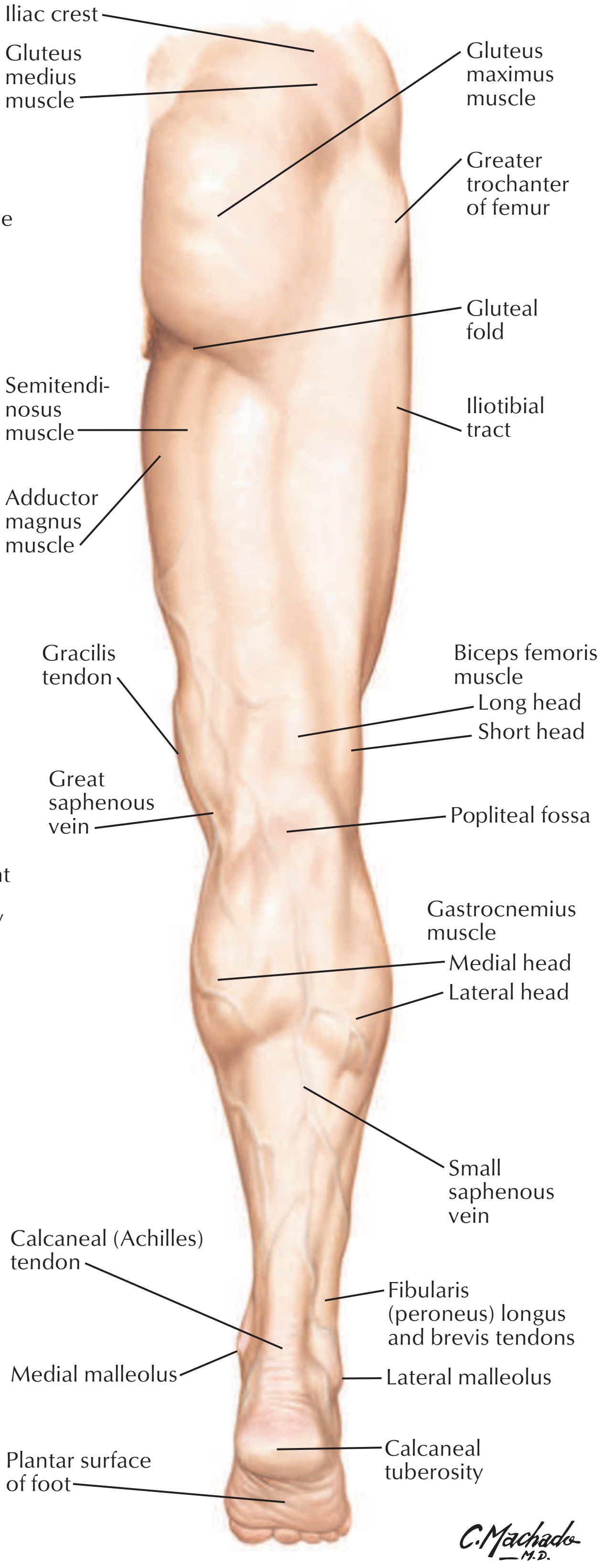
BP116 Cross-Sectional Anatomy of Ankle and Foot (continued)

BP117 Anatomy of Toenail

Anterior view


Iliac crest
Anterior superior iliac spine
Tensor fasciae latae muscle
Inguinal ligament
Sartorius muscle
Rectus femoris muscle
Great saphenous vein
Vastus lateralis muscle
Vastus medialis muscle
Rectus femoris tendon
Iliotibial tract
Quadriceps femoris tendon
Patella
Patellar ligament
Fibularis longus muscle
Tibial tuberosity
Tibialis anterior muscle
Anterior border of tibia
Great saphenous vein
Lateral malleolus
Medial malleolus
Extensor digitorum longus tendons
Extensor hallucis longus tendon

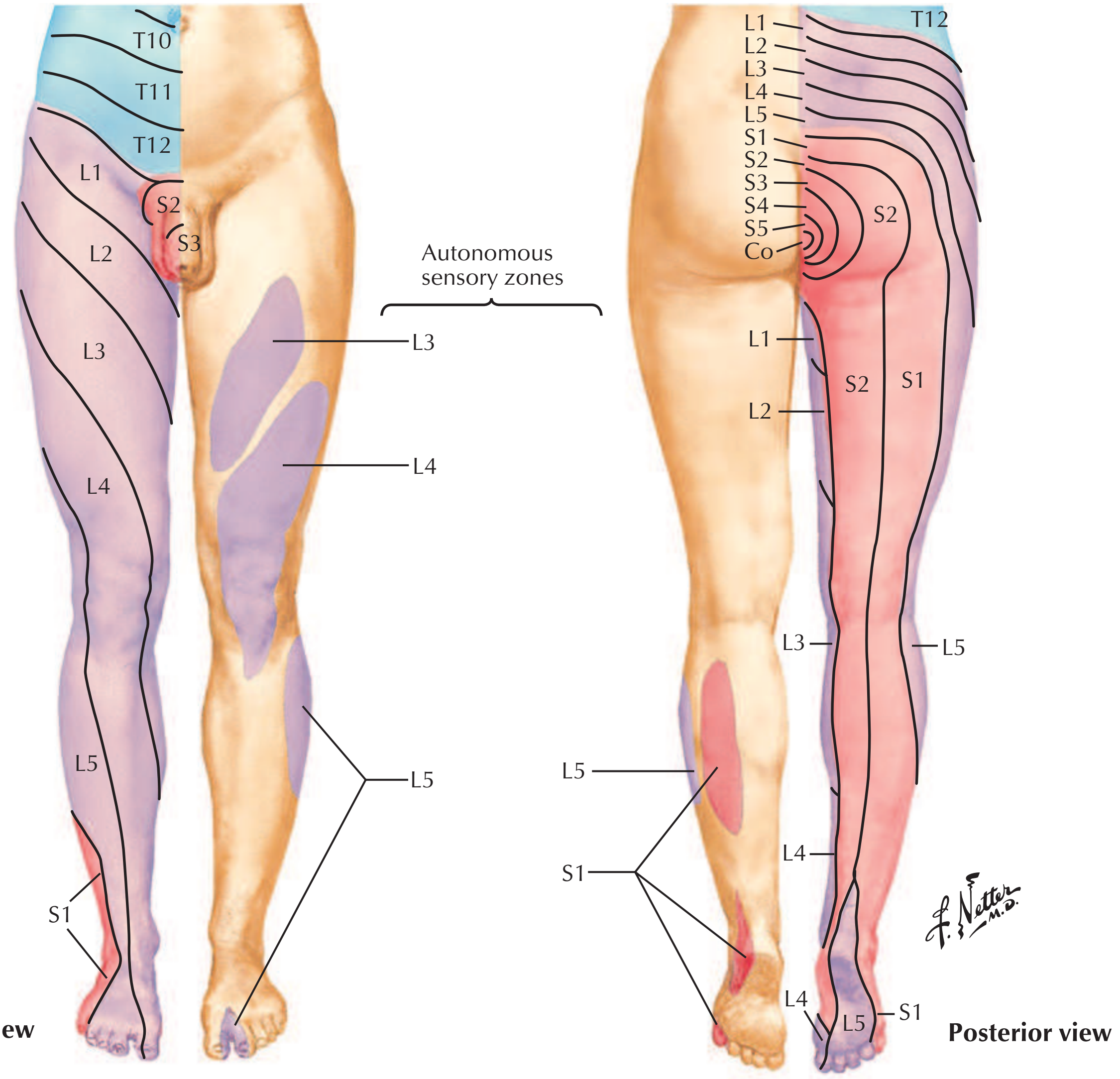
Posterior view


Iliac crest
Gluteus medius muscle
Gluteus maximus muscle
Greater trochanter of femur
Gluteal fold
Semitendinosus muscle
Iliotibial tract
Adductor magnus muscle
Gracilis tendon
Biceps femoris muscle
Long head
Short head
Great saphenous vein
Popliteal fossa
Gastrocnemius muscle
Medial head
Lateral head
Small saphenous vein
Calcaneal (Achilles) tendon
Fibularis (peroneus) longus and brevis tendons
Medial malleolus
Lateral malleolus
Calcaneal tuberosity
Plantar surface of foot
C.Machado M.D.

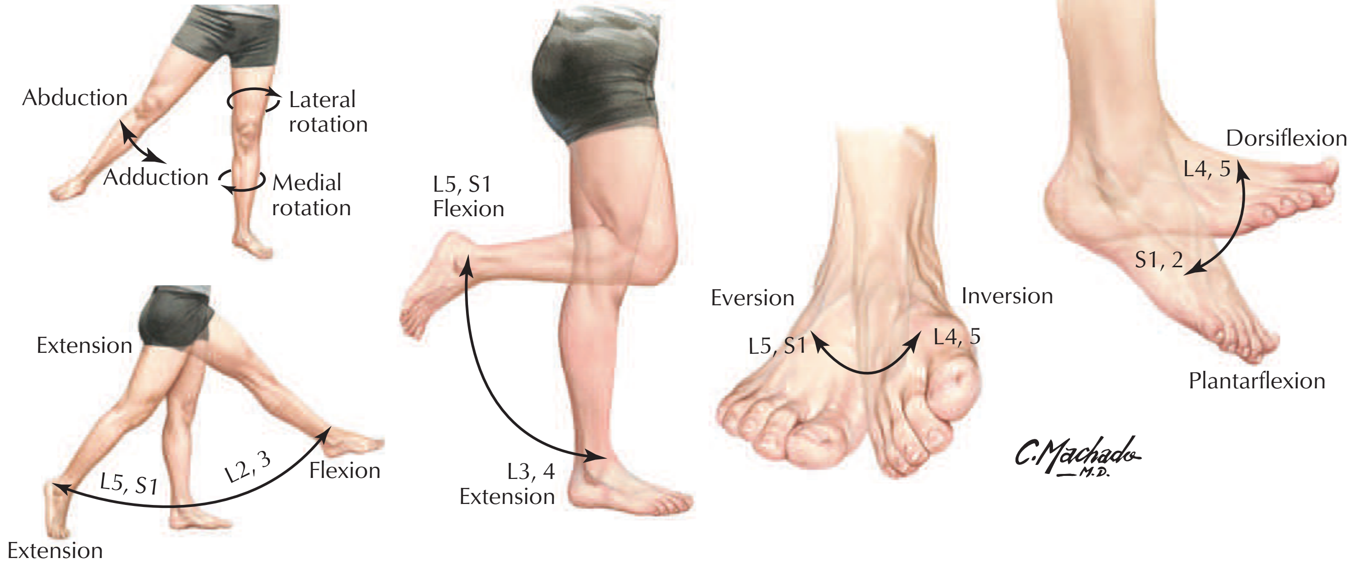
Dermatomes of Lower Limb and Segmental Nerve Function

See also **Plate 171**

Schematic demarcation of dermatomes (according to Keegan and Garrett) shown as distinct segments. There is considerable overlap between any two adjacent dermatomes.

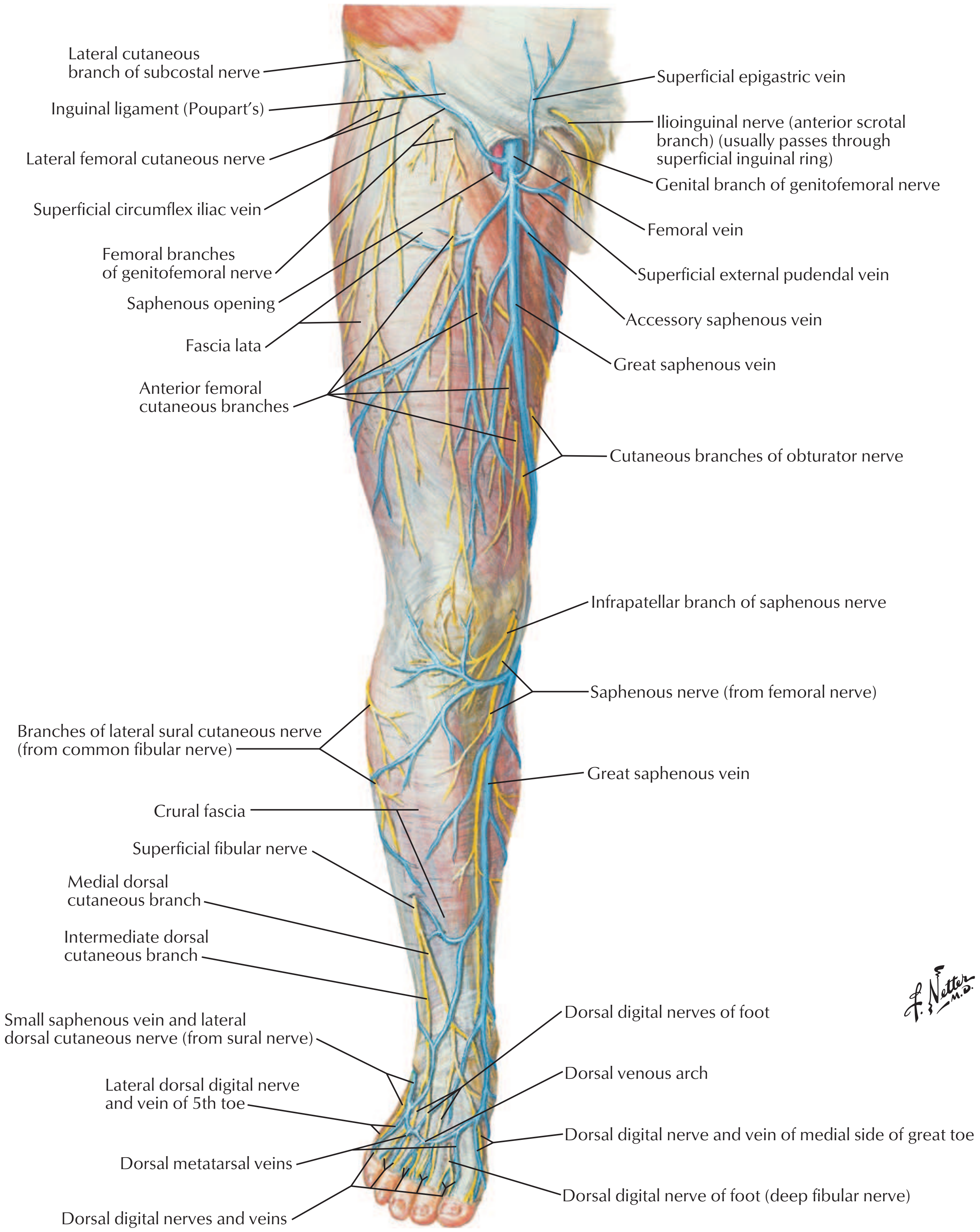

T10
T11
T12
L1
S2
S3
L2
L3
L4
L5
S1
Anterior view
Autonomous sensory zones
L3
L4
L5
L1
L2
L3
L4
L5
S1
S2
S3
S4
S5
Co
T12
S2
L1
S2
S1
L2
L3
L5
L5
S1
L4
L4
L5
S1
Posterior view

Segmental innervation of lower limb movements


Abduction
Adduction
Lateral rotation
Medial rotation
Extension
L5, S1
L2, 3
Flexion
Extension
L5, S1
Flexion
L3, 4
Extension
Eversion
L5, S1
Inversion
L4, 5
Dorsiflexion
L4, 5
S1, 2
Plantarflexion

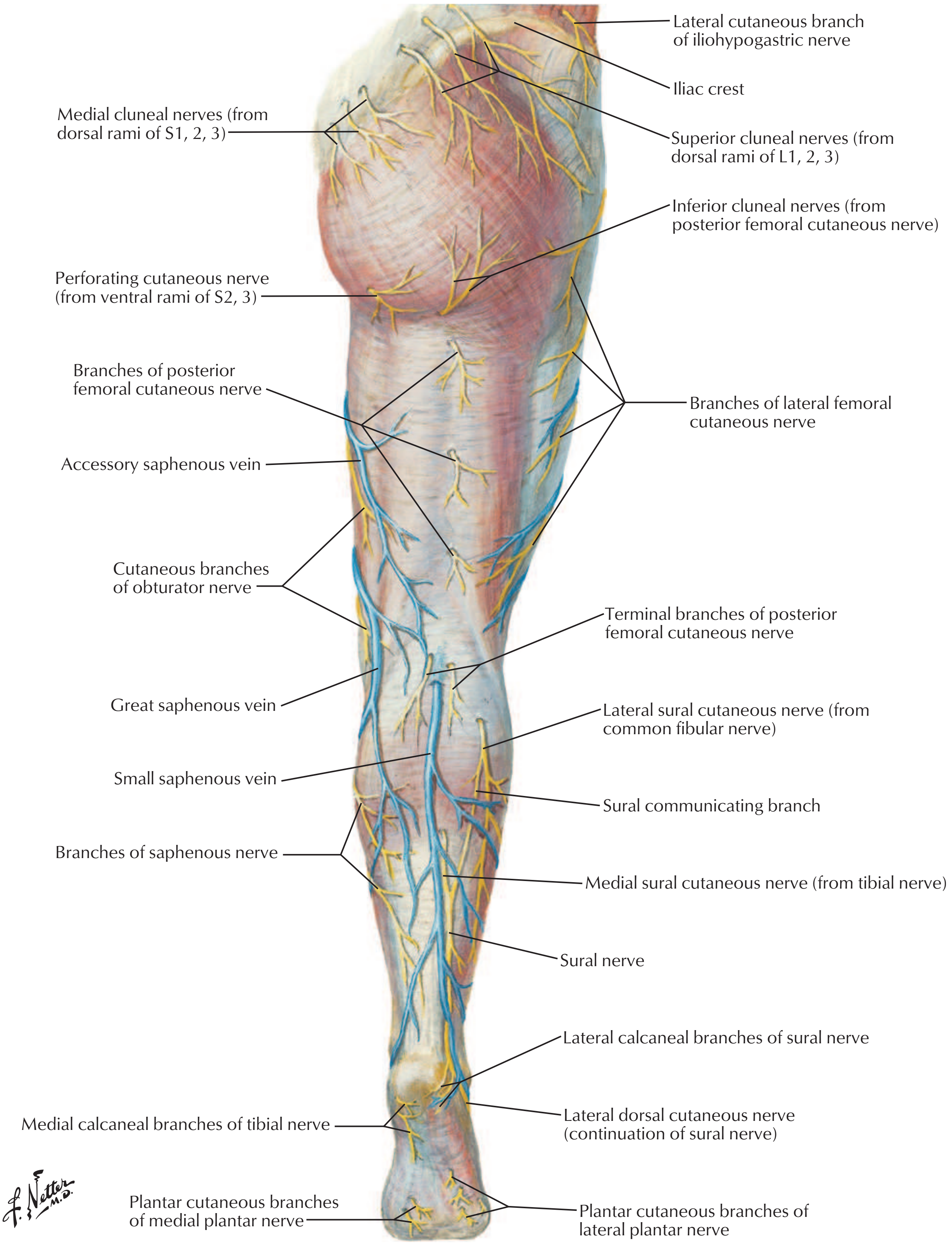
Superficial Nerves and Veins of Lower Limb: Anterior View

See also Plates 529, 530, 533


Lateral cutaneous branch of subcostal nerve
Inguinal ligament (Poupart's)
Lateral femoral cutaneous nerve
Superficial circumflex iliac vein
Femoral branches of genitofemoral nerve
Saphenous opening
Fascia lata
Anterior femoral cutaneous branches
Superficial epigastric vein
Ilioinguinal nerve (anterior scrotal branch) (usually passes through superficial inguinal ring)
Genital branch of genitofemoral nerve
Femoral vein
Superficial external pudendal vein
Accessory saphenous vein
Great saphenous vein
Cutaneous branches of obturator nerve
Infrapatellar branch of saphenous nerve
Saphenous nerve (from femoral nerve)
Great saphenous vein
Branches of lateral sural cutaneous nerve (from common fibular nerve)
Crural fascia
Superficial fibular nerve
Medial dorsal cutaneous branch
Intermediate dorsal cutaneous branch
Small saphenous vein and lateral dorsal cutaneous nerve (from sural nerve)
Lateral dorsal digital nerve and vein of 5th toe
Dorsal metatarsal veins
Dorsal digital nerves and veins
Dorsal digital nerves of foot
Dorsal venous arch
Dorsal digital nerve and vein of medial side of great toe
Dorsal digital nerve of foot (deep fibular nerve)
F. Netter M.D.

Superficial Nerves and Veins of Lower Limb: Posterior View

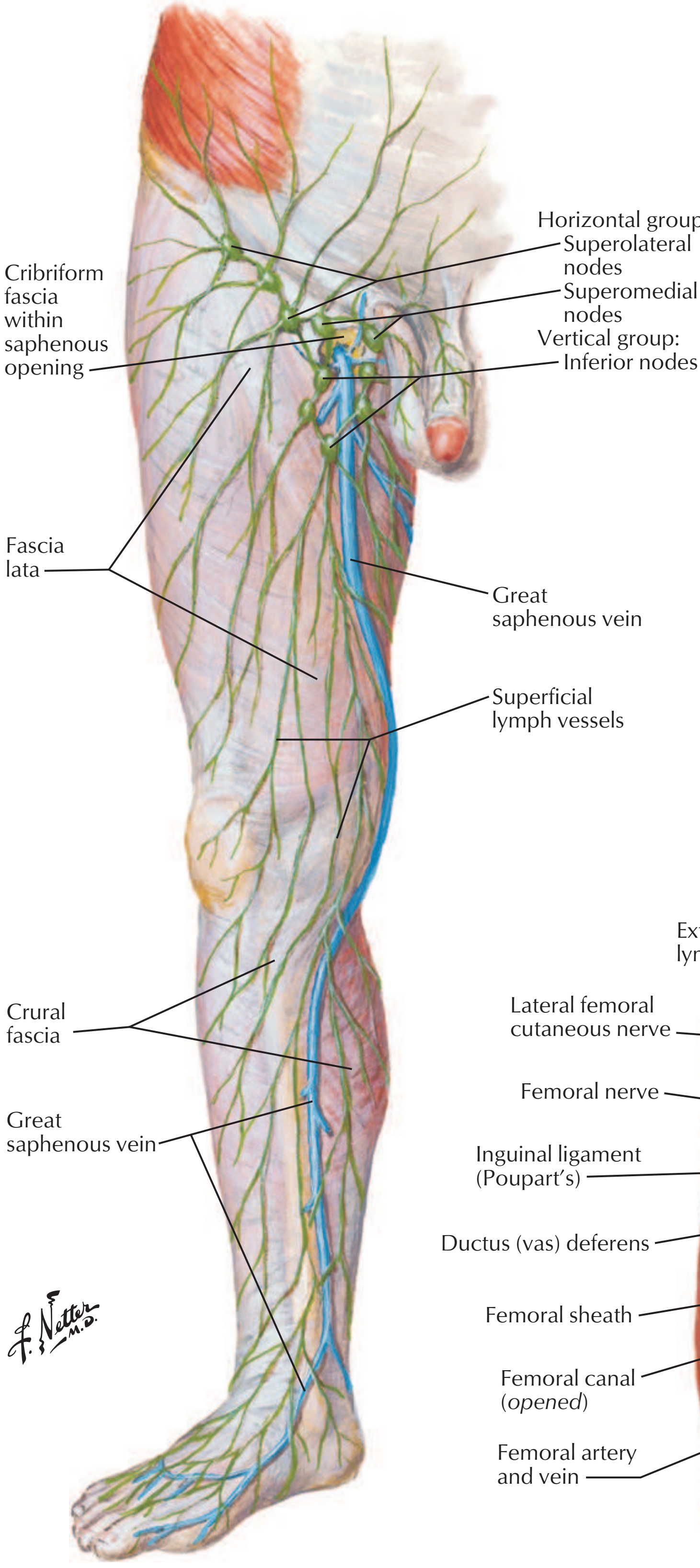
See also Plates 531, 532

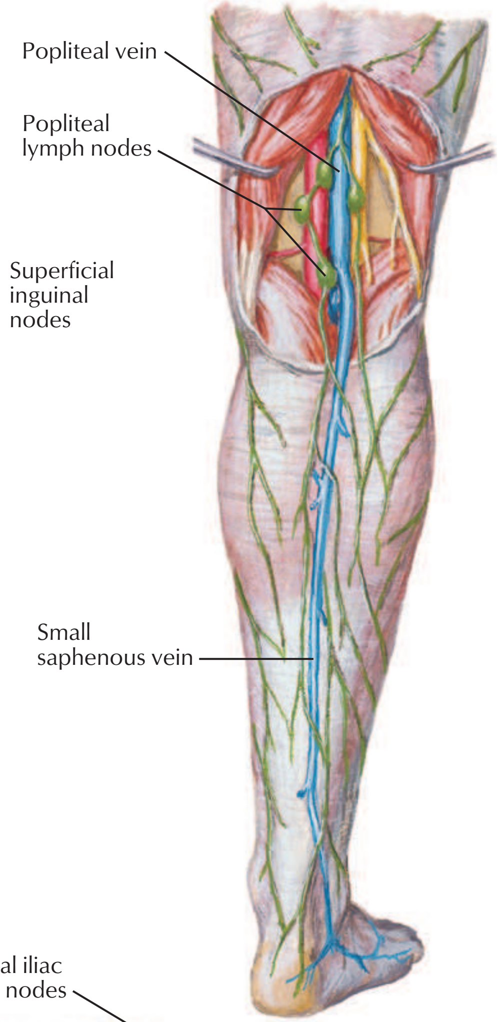


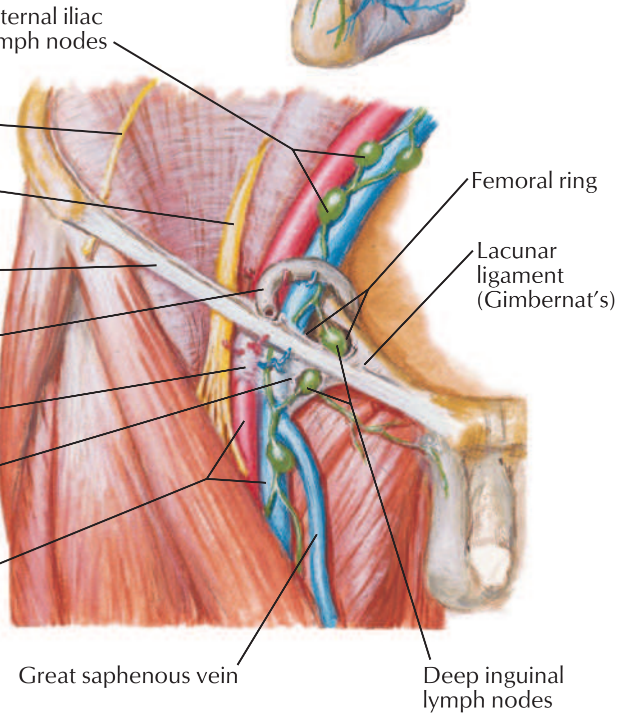
Lateral cutaneous branch of iliohypogastric nerve
Iliac crest
Medial cluneal nerves (from dorsal rami of S1, 2, 3)
Superior cluneal nerves (from dorsal rami of L1, 2, 3)
Inferior cluneal nerves (from posterior femoral cutaneous nerve)
Perforating cutaneous nerve (from ventral rami of S2, 3)
Branches of posterior femoral cutaneous nerve
Branches of lateral femoral cutaneous nerve
Accessory saphenous vein
Cutaneous branches of obturator nerve
Terminal branches of posterior femoral cutaneous nerve
Great saphenous vein
Lateral sural cutaneous nerve (from common fibular nerve)
Small saphenous vein
Sural communicating branch
Branches of saphenous nerve
Medial sural cutaneous nerve (from tibial nerve)
Sural nerve
Lateral calcaneal branches of sural nerve
Medial calcaneal branches of tibial nerve
Lateral dorsal cutaneous nerve (continuation of sural nerve)
Plantar cutaneous branches of medial plantar nerve
Plantar cutaneous branches of lateral plantar nerve

Lymph Vessels and Nodes of Lower Limb

See also Plates 389, 390

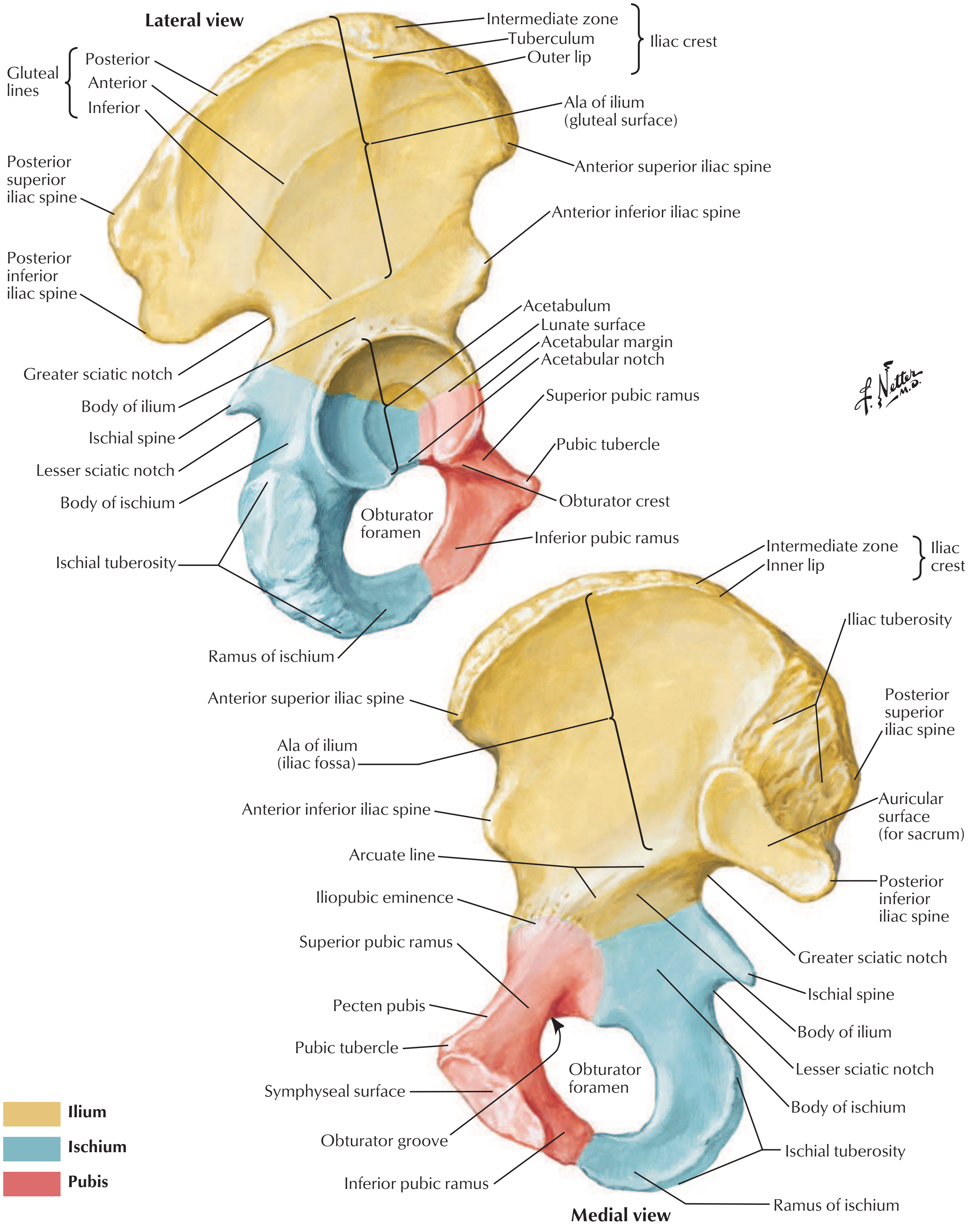

Cribriform fascia within saphenous opening
Horizontal group:
Superolateral nodes
Superomedial nodes
Vertical group:
Inferior nodes
Superficial inguinal nodes
Fascia lata
Great saphenous vein
Superficial lymph vessels
Crural fascia
Great saphenous vein
F. Netter M.D.


Popliteal vein
Popliteal lymph nodes
Small saphenous vein


External iliac lymph nodes
Lateral femoral cutaneous nerve
Femoral nerve
Inguinal ligament (Poupart's)
Ductus (vas) deferens
Femoral sheath
Femoral canal (opened)
Femoral artery and vein
Great saphenous vein
Femoral ring
Lacunar ligament (Gimbernat's)
Deep inguinal lymph nodes

Coxal Bone

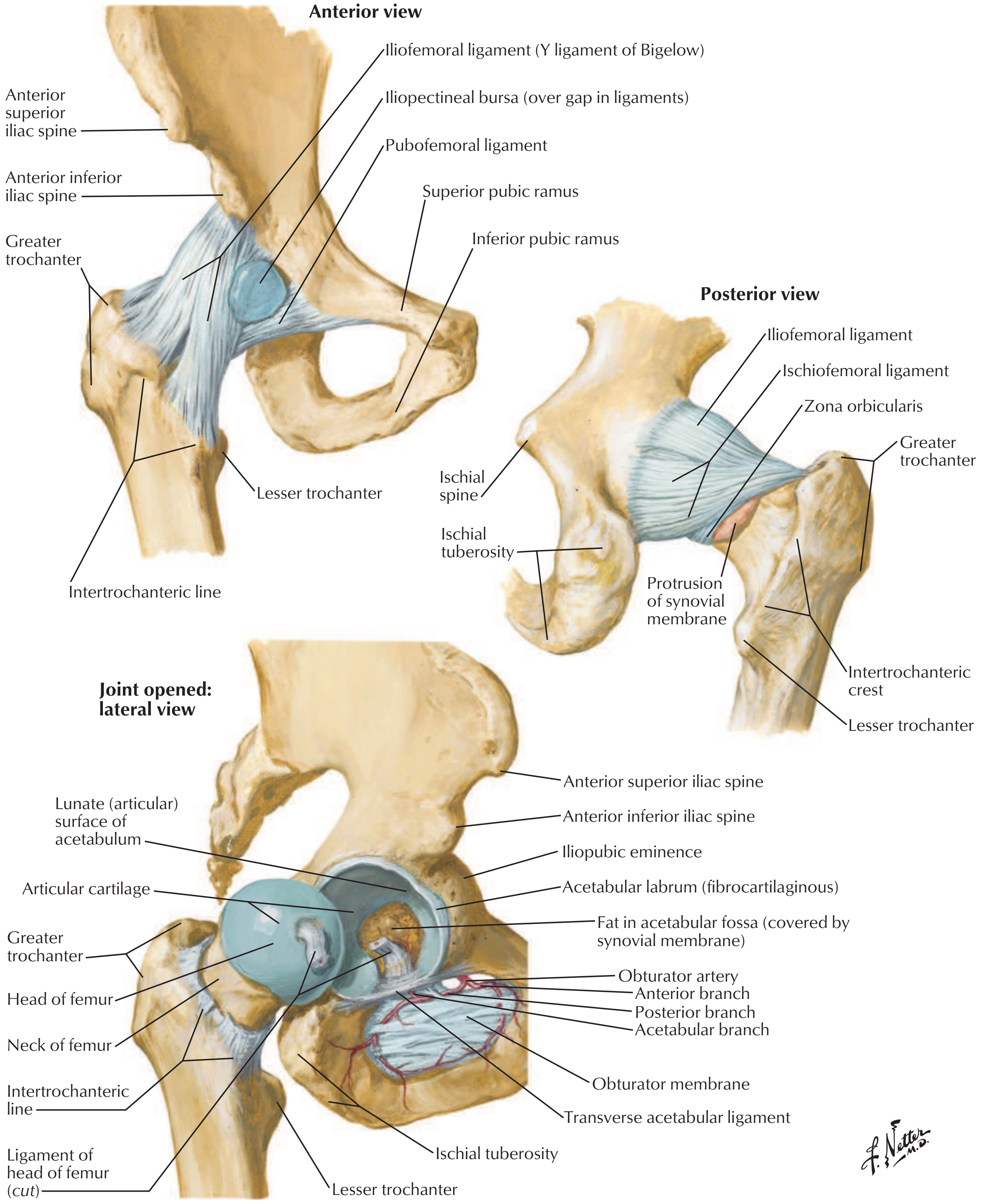
See also Plates 250, 337, 338



Lateral view
Gluteal lines
Posterior
Anterior
Inferior
Posterior superior iliac spine
Posterior inferior iliac spine
Greater sciatic notch
Body of ilium
Ischial spine
Lesser sciatic notch
Body of ischium
Ischial tuberosity
Ramus of ischium
Intermediate zone
Tuberculum
Outer lip
Iliac crest
Ala of ilium (gluteal surface)
Anterior superior iliac spine
Anterior inferior iliac spine
Acetabulum
Lunate surface
Acetabular margin
Acetabular notch
Superior pubic ramus
Pubic tubercle
Obturator crest
Obturator foramen
Inferior pubic ramus
Intermediate zone
Inner lip
Iliac crest
Iliac tuberosity
Posterior superior iliac spine
Auricular surface (for sacrum)
Posterior inferior iliac spine
Greater sciatic notch
Ischial spine
Body of ilium
Lesser sciatic notch
Body of ischium
Ischial tuberosity
Ramus of ischium
Anterior superior iliac spine
Ala of ilium (iliac fossa)
Anterior inferior iliac spine
Arcuate line
Iliopubic eminence
Superior pubic ramus
Pecten pubis
Pubic tubercle
Symphyseal surface
Obturator groove
Inferior pubic ramus
Obturator foramen
Medial view
Ilium
Ischium
Pubis

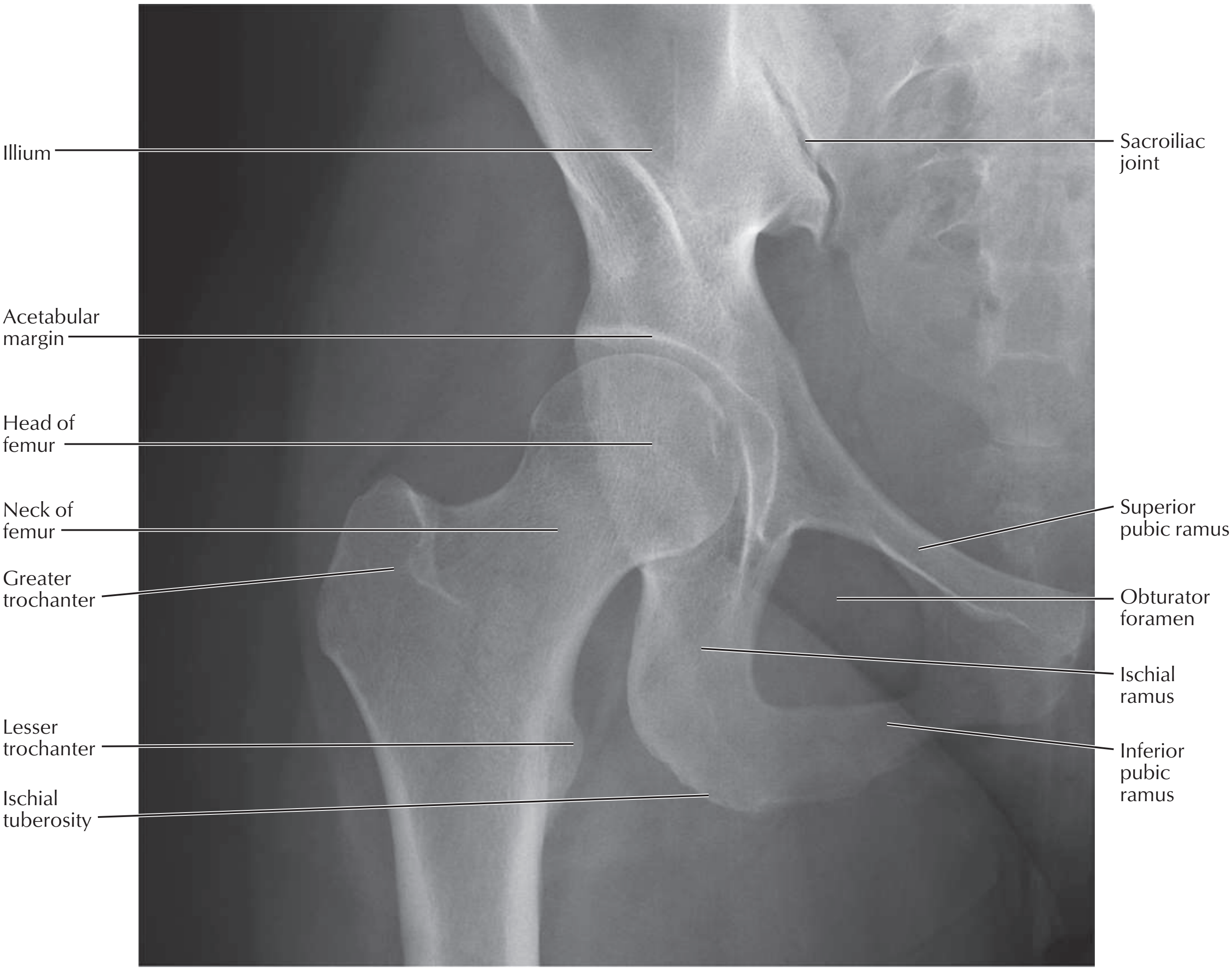
Hip Joint

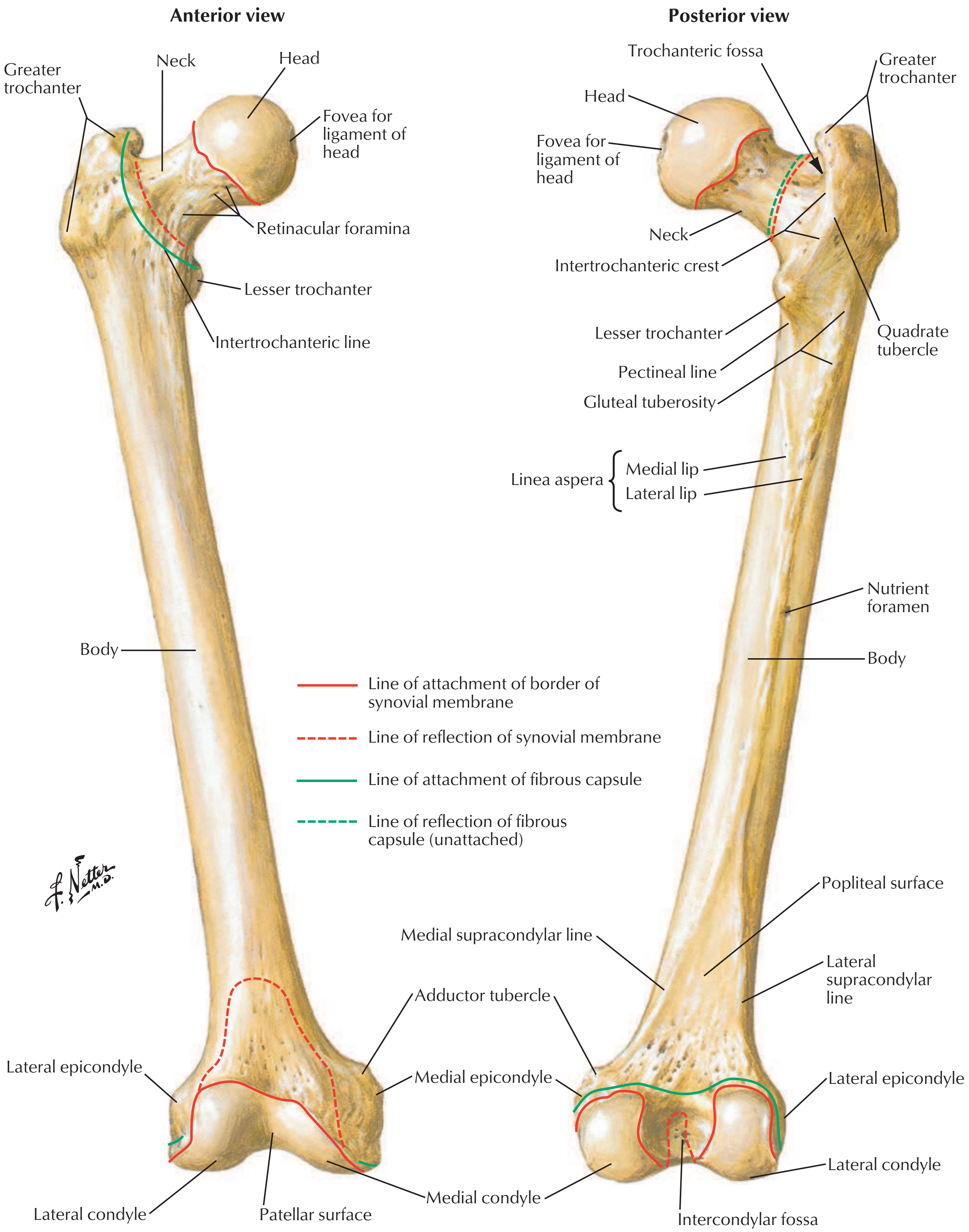
See also Plates 334, 338


Anterior view
Iliofemoral ligament (Y ligament of Bigelow)
Iliopectineal bursa (over gap in ligaments)
Pubofemoral ligament
Superior pubic ramus
Inferior pubic ramus
Anterior superior iliac spine
Anterior inferior iliac spine
Greater trochanter
Lesser trochanter
Intertrochanteric line
Posterior view
Iliofemoral ligament
Ischiofemoral ligament
Zona orbicularis
Greater trochanter
Ischial spine
Ischial tuberosity
Protrusion of synovial membrane
Intertrochanteric crest
Lesser trochanter
Joint opened: lateral view
Anterior superior iliac spine
Anterior inferior iliac spine
Iliopubic eminence
Acetabular labrum (fibrocartilaginous)
Fat in acetabular fossa (covered by synovial membrane)
Obturator artery
Anterior branch
Posterior branch
Acetabular branch
Obturator membrane
Transverse acetabular ligament
Ischial tuberosity
Lesser trochanter
Lunate (articular) surface of acetabulum
Articular cartilage
Greater trochanter
Head of femur
Neck of femur
Intertrochanteric line
Ligament of head of femur (*cut*)
F. Netter M.D.

Hip Joint: Anteroposterior Radiograph

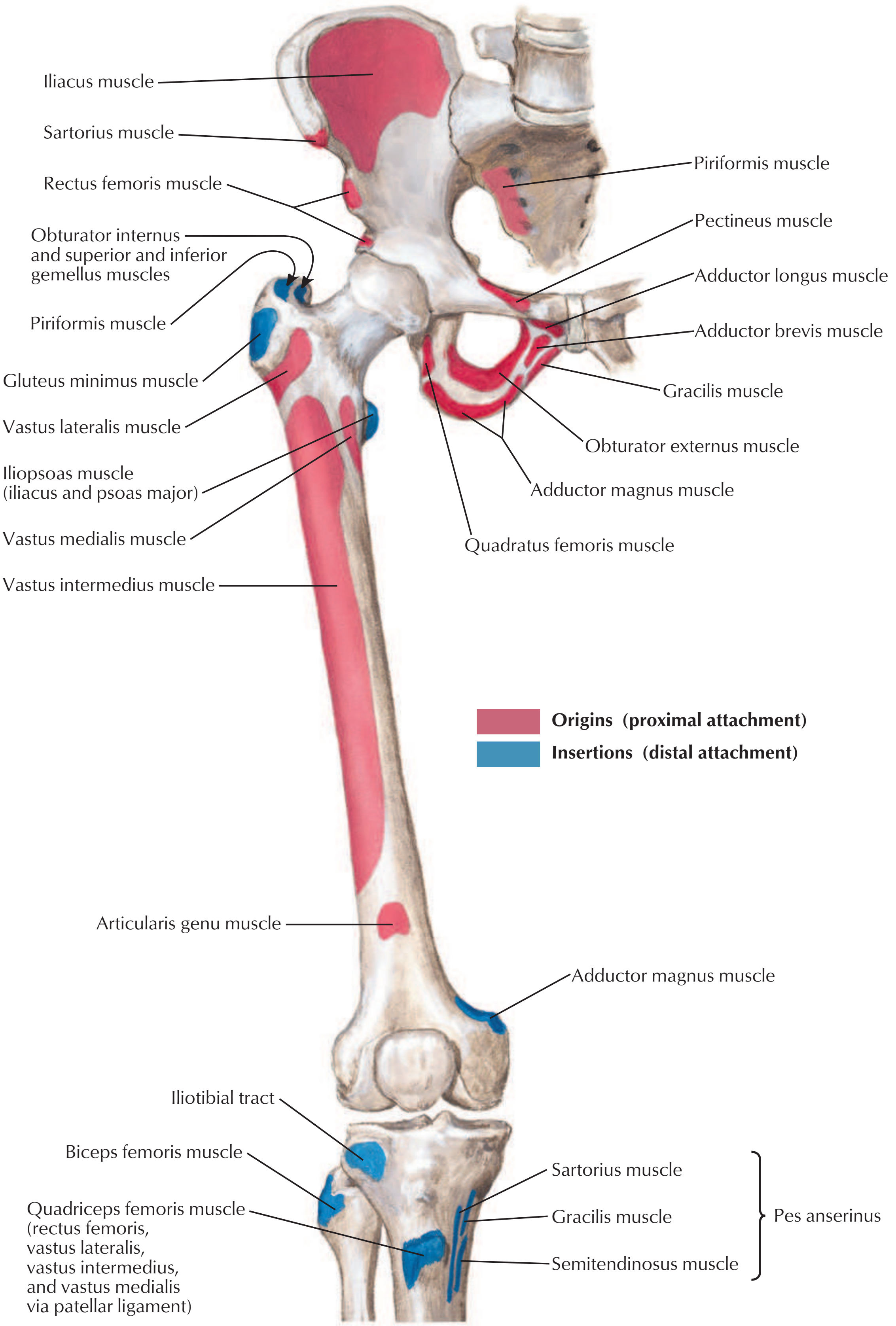
See also Plates 335, 477, 480


Illium
Acetabular margin
Head of femur
Neck of femur
Greater trochanter
Lesser trochanter
Ischial tuberosity
Sacroiliac joint
Superior pubic ramus
Obturator foramen
Ischial ramus
Inferior pubic ramus


Anterior view
Greater trochanter
Neck
Head
Fovea for ligament of head
Retinacular foramina
Lesser trochanter
Intertrochanteric line
Body
Lateral epicondyle
Adductor tubercle
Medial epicondyle
Lateral condyle
Patellar surface
Medial condyle
Posterior view
Trochanteric fossa
Greater trochanter
Head
Fovea for ligament of head
Neck
Intertrochanteric crest
Lesser trochanter
Quadrate tubercle
Pectineal line
Gluteal tuberosity
Linea aspera
Medial lip
Lateral lip
Nutrient foramen
Body
Popliteal surface
Medial supracondylar line
Lateral supracondylar line
Lateral epicondyle
Lateral condyle
Intercondylar fossa
— Line of attachment of border of synovial membrane
- - - Line of reflection of synovial membrane
— Line of attachment of fibrous capsule
- - - Line of reflection of fibrous capsule (unattached)
F. Netter M.D.

Bony Attachments of Muscles of Hip and Thigh: Anterior View

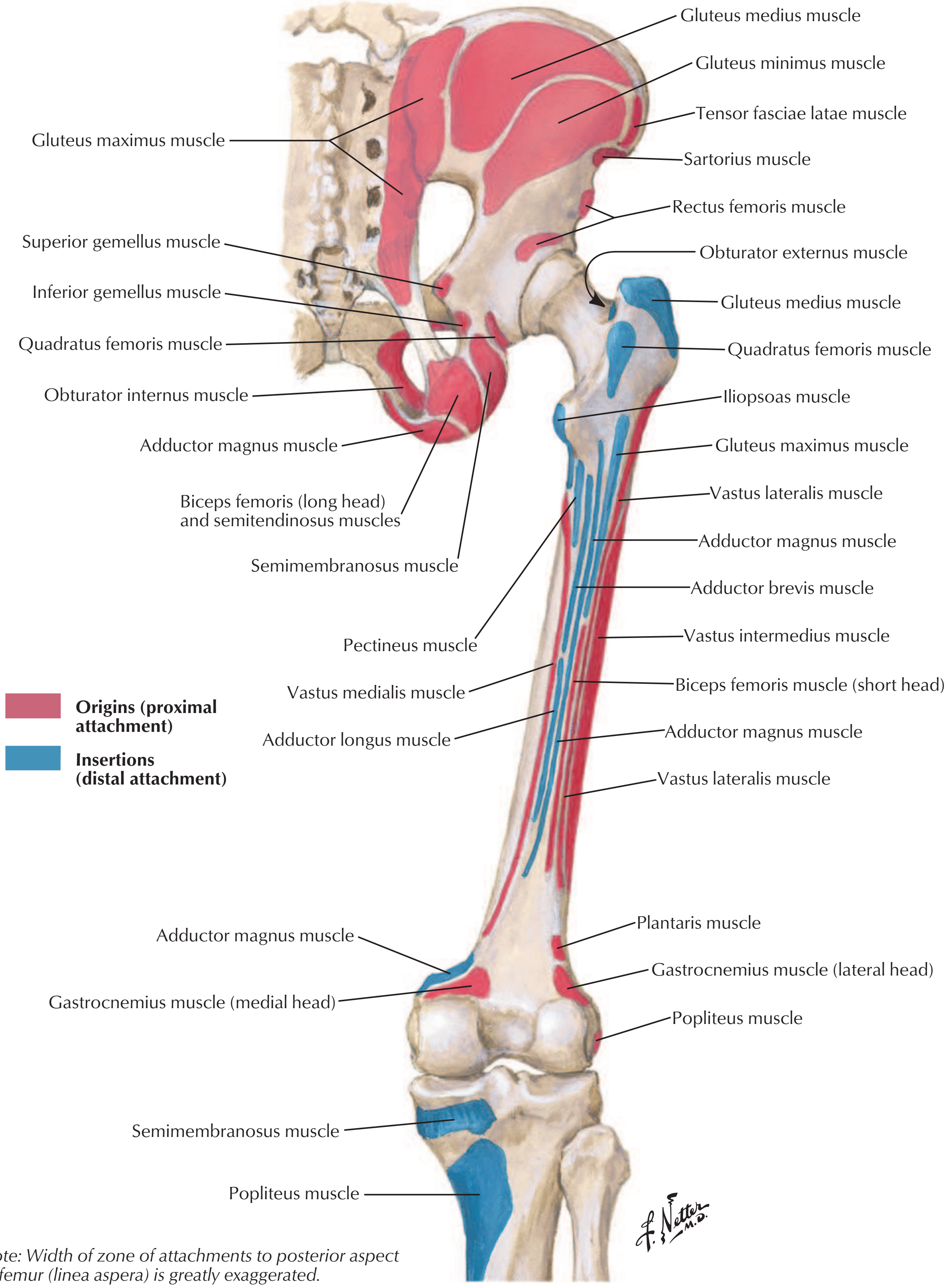
See also Plates 478, 534


Iliacus muscle
Sartorius muscle
Rectus femoris muscle
Obturator internus and superior and inferior gemellus muscles
Piriformis muscle
Gluteus minimus muscle
Vastus lateralis muscle
Iliopsoas muscle (iliacus and psoas major)
Vastus medialis muscle
Vastus intermedius muscle
Piriformis muscle
Pectineus muscle
Adductor longus muscle
Adductor brevis muscle
Gracilis muscle
Obturator externus muscle
Adductor magnus muscle
Quadratus femoris muscle
Articularis genu muscle
Adductor magnus muscle
Iliotibial tract
Biceps femoris muscle
Quadriceps femoris muscle (rectus femoris, vastus lateralis, vastus intermedius, and vastus medialis via patellar ligament)
Sartorius muscle
Gracilis muscle
Semitendinosus muscle
Pes anserinus

🟥 **Origins (proximal attachment)**
🟦 **Insertions (distal attachment)**

Bony Attachments of Muscles of Hip and Thigh: Posterior View

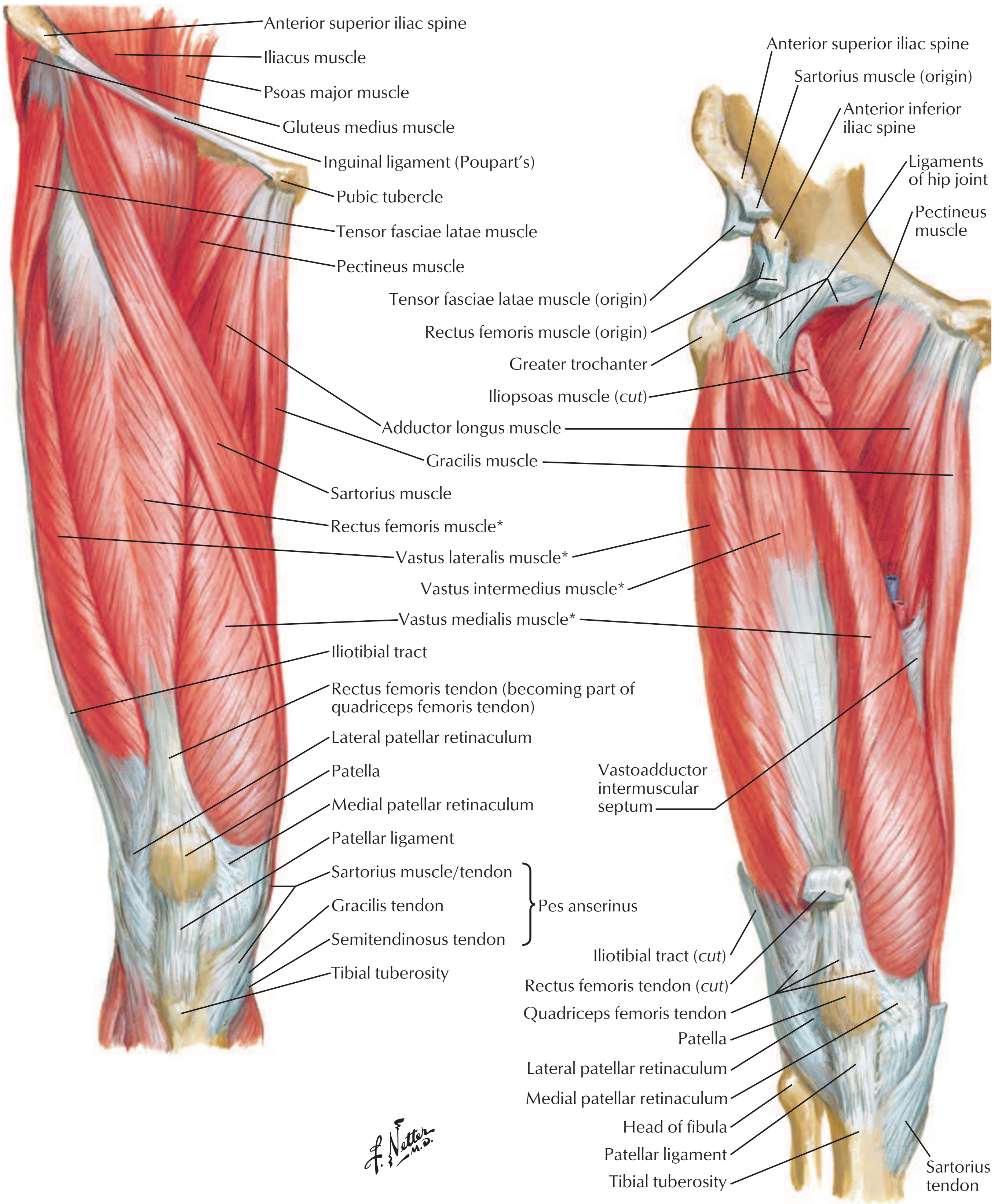
See also Plate 478


Gluteus medius muscle
Gluteus minimus muscle
Tensor fasciae latae muscle
Gluteus maximus muscle
Sartorius muscle
Rectus femoris muscle
Superior gemellus muscle
Obturator externus muscle
Inferior gemellus muscle
Gluteus medius muscle
Quadratus femoris muscle
Quadratus femoris muscle
Obturator internus muscle
Iliopsoas muscle
Adductor magnus muscle
Gluteus maximus muscle
Biceps femoris (long head) and semitendinosus muscles
Vastus lateralis muscle
Adductor magnus muscle
Semimembranosus muscle
Adductor brevis muscle
Pectineus muscle
Vastus intermedius muscle
Vastus medialis muscle
Biceps femoris muscle (short head)
🟥 Origins (proximal attachment)
🟦 Insertions (distal attachment)
Adductor longus muscle
Adductor magnus muscle
Vastus lateralis muscle
Plantaris muscle
Adductor magnus muscle
Gastrocnemius muscle (lateral head)
Gastrocnemius muscle (medial head)
Popliteus muscle
Semimembranosus muscle
Popliteus muscle

Note: Width of zone of attachments to posterior aspect of femur (linea aspera) is greatly exaggerated.

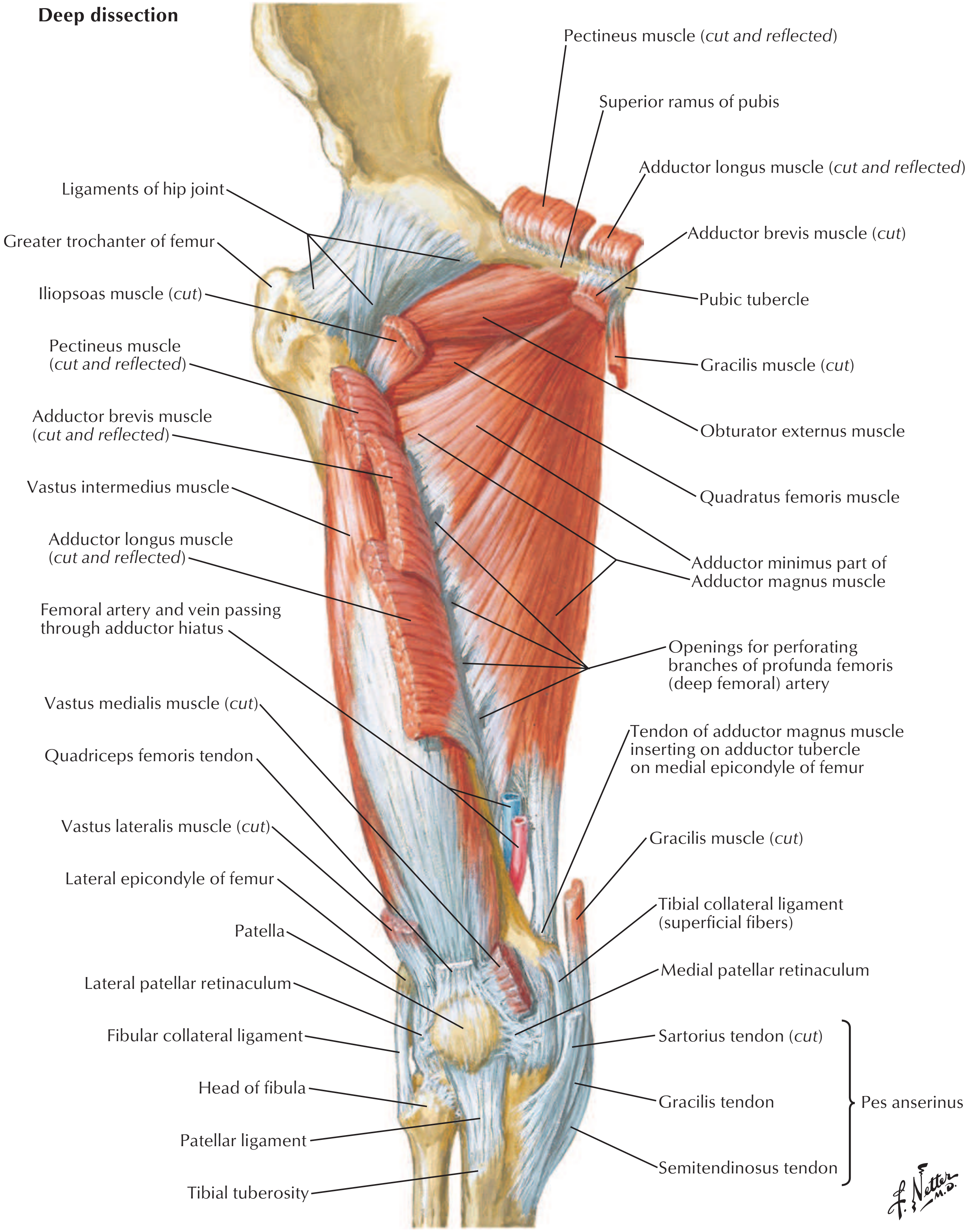
Muscles of Thigh: Anterior Views

See also **Plate 265**


Anterior superior iliac spine
Iliacus muscle
Psoas major muscle
Gluteus medius muscle
Inguinal ligament (Poupart's)
Pubic tubercle
Tensor fasciae latae muscle
Pectineus muscle
Tensor fasciae latae muscle (origin)
Rectus femoris muscle (origin)
Greater trochanter
Iliopsoas muscle (*cut*)
Adductor longus muscle
Gracilis muscle
Sartorius muscle
Rectus femoris muscle*
Vastus lateralis muscle*
Vastus intermedius muscle*
Vastus medialis muscle*
Iliotibial tract
Rectus femoris tendon (becoming part of quadriceps femoris tendon)
Lateral patellar retinaculum
Patella
Medial patellar retinaculum
Patellar ligament
Sartorius muscle/tendon
Gracilis tendon
Semitendinosus tendon
Pes anserinus
Tibial tuberosity
Anterior superior iliac spine
Sartorius muscle (origin)
Anterior inferior iliac spine
Ligaments of hip joint
Pectineus muscle
Vastoadductor intermuscular septum
Iliotibial tract (*cut*)
Rectus femoris tendon (*cut*)
Quadriceps femoris tendon
Patella
Lateral patellar retinaculum
Medial patellar retinaculum
Head of fibula
Patellar ligament
Tibial tuberosity
Sartorius tendon

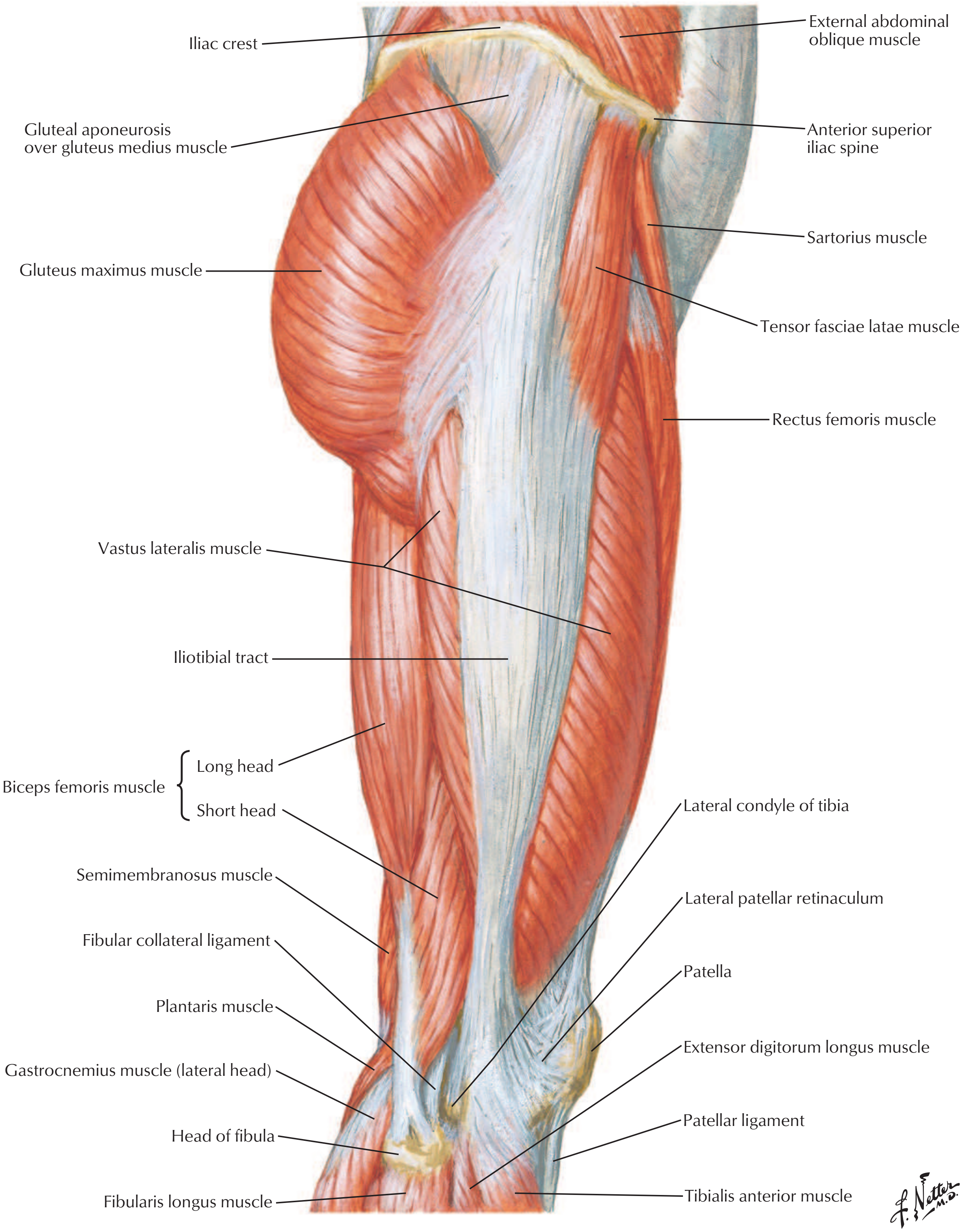
*Muscles of quadriceps femoris

Deep dissection

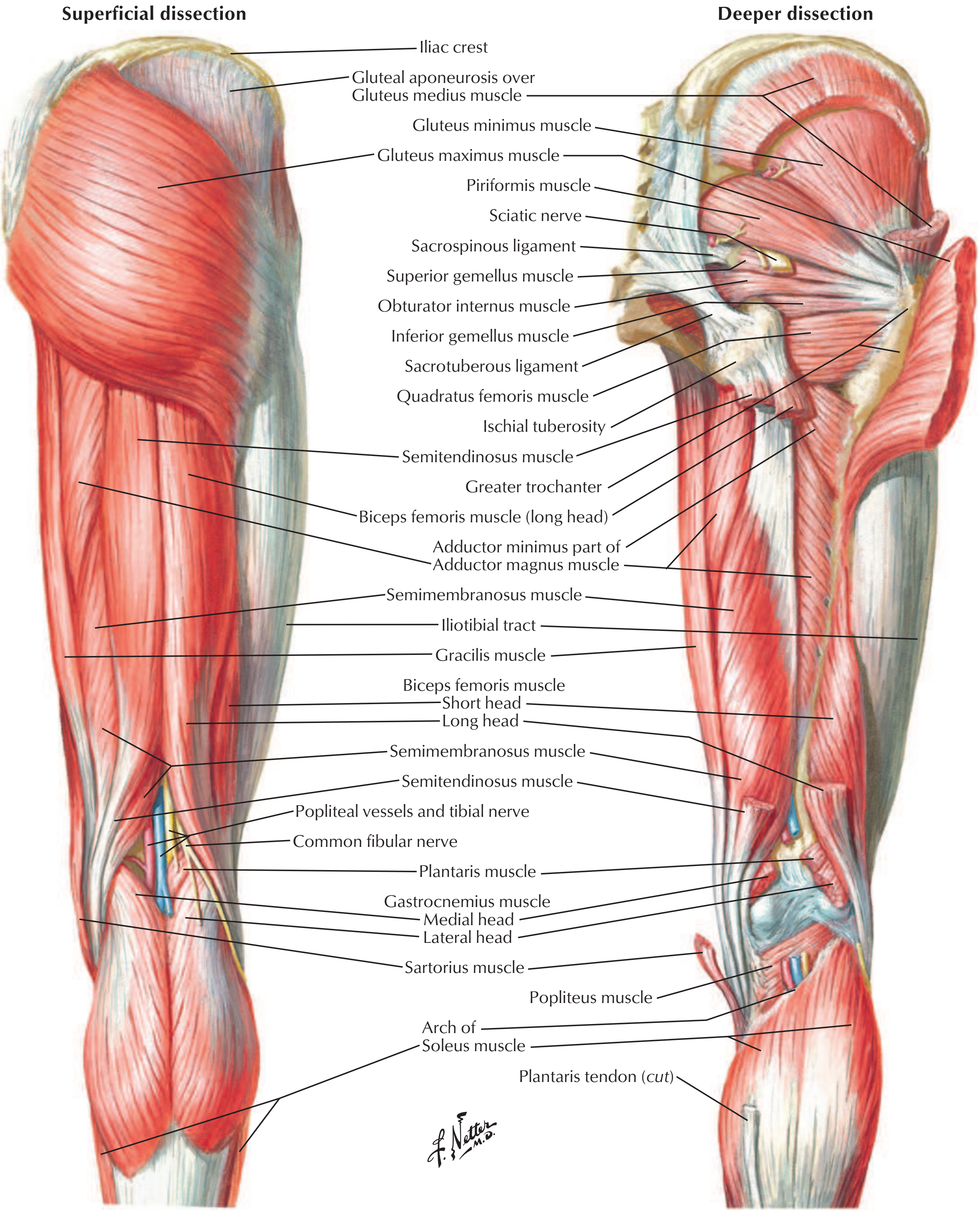

Pectineus muscle (*cut and reflected*)
Superior ramus of pubis
Adductor longus muscle (*cut and reflected*)
Ligaments of hip joint
Adductor brevis muscle (*cut*)
Greater trochanter of femur
Pubic tubercle
Iliopsoas muscle (*cut*)
Pectineus muscle (*cut and reflected*)
Gracilis muscle (*cut*)
Obturator externus muscle
Adductor brevis muscle (*cut and reflected*)
Vastus intermedius muscle
Quadratus femoris muscle
Adductor longus muscle (*cut and reflected*)
Adductor minimus part of Adductor magnus muscle
Femoral artery and vein passing through adductor hiatus
Openings for perforating branches of profunda femoris (deep femoral) artery
Vastus medialis muscle (*cut*)
Tendon of adductor magnus muscle inserting on adductor tubercle on medial epicondyle of femur
Quadriceps femoris tendon
Vastus lateralis muscle (*cut*)
Gracilis muscle (*cut*)
Lateral epicondyle of femur
Tibial collateral ligament (superficial fibers)
Patella
Medial patellar retinaculum
Lateral patellar retinaculum
Fibular collateral ligament
Sartorius tendon (*cut*)
Head of fibula
Gracilis tendon
Pes anserinus
Patellar ligament
Semitendinosus tendon
Tibial tuberosity
F. Netter M.D.

Muscles of Hip and Thigh: Lateral View

See also **Plate 496**

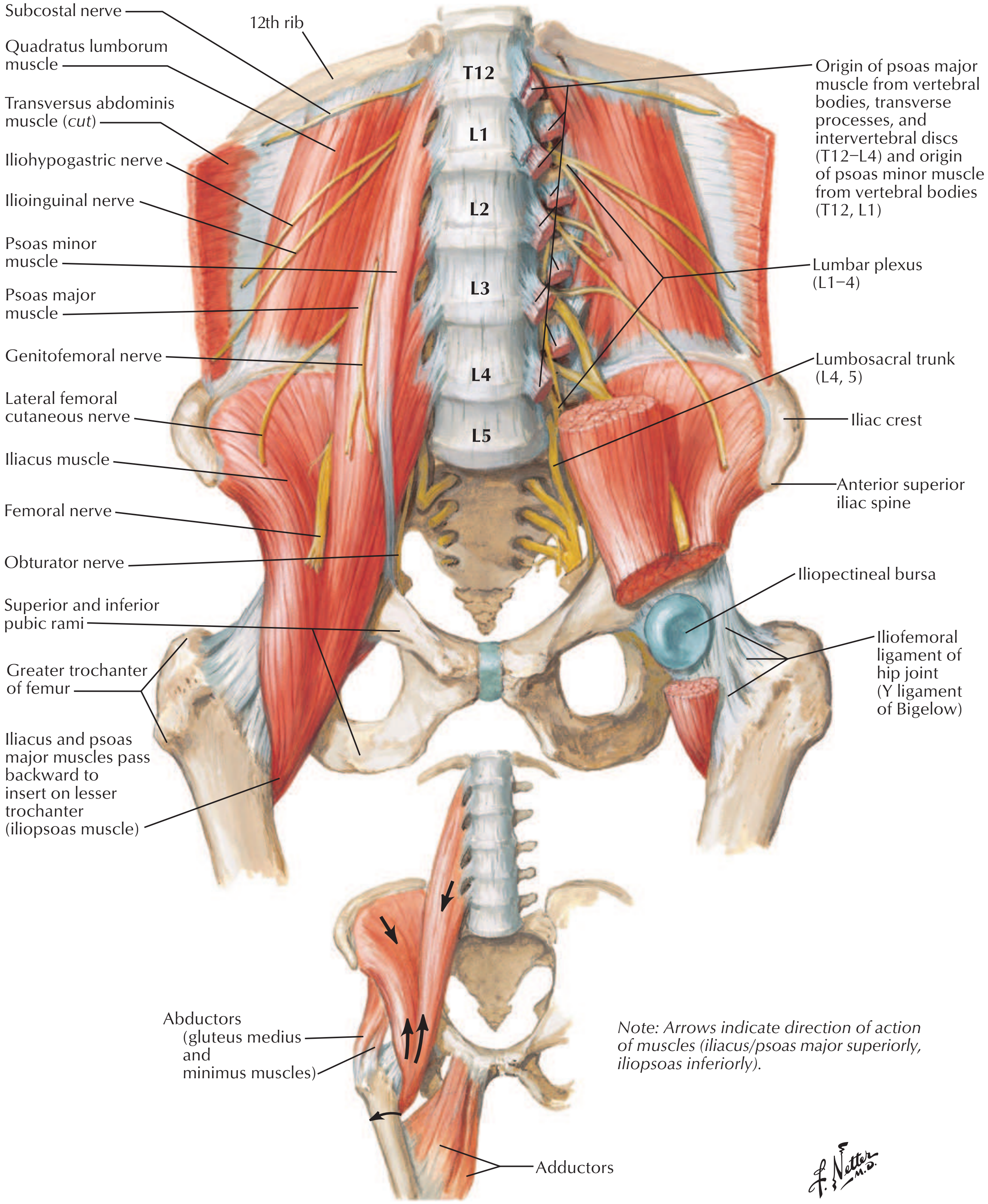

Iliac crest
External abdominal oblique muscle
Gluteal aponeurosis over gluteus medius muscle
Anterior superior iliac spine
Sartorius muscle
Gluteus maximus muscle
Tensor fasciae latae muscle
Rectus femoris muscle
Vastus lateralis muscle
Iliotibial tract
Biceps femoris muscle
Long head
Short head
Lateral condyle of tibia
Semimembranosus muscle
Lateral patellar retinaculum
Fibular collateral ligament
Patella
Plantaris muscle
Extensor digitorum longus muscle
Gastrocnemius muscle (lateral head)
Patellar ligament
Head of fibula
Fibularis longus muscle
Tibialis anterior muscle
F. Netter M.D.

Muscles of Hip and Thigh: Posterior Views


Superficial dissection
Deeper dissection
Iliac crest
Gluteal aponeurosis over
Gluteus medius muscle
Gluteus minimus muscle
Gluteus maximus muscle
Piriformis muscle
Sciatic nerve
Sacrospinous ligament
Superior gemellus muscle
Obturator internus muscle
Inferior gemellus muscle
Sacrotuberous ligament
Quadratus femoris muscle
Ischial tuberosity
Semitendinosus muscle
Greater trochanter
Biceps femoris muscle (long head)
Adductor minimus part of
Adductor magnus muscle
Semimembranosus muscle
Iliotibial tract
Gracilis muscle
Biceps femoris muscle
Short head
Long head
Semimembranosus muscle
Semitendinosus muscle
Popliteal vessels and tibial nerve
Common fibular nerve
Plantaris muscle
Gastrocnemius muscle
Medial head
Lateral head
Sartorius muscle
Popliteus muscle
Arch of
Soleus muscle
Plantaris tendon (cut)

Psoas and Iliacus Muscles

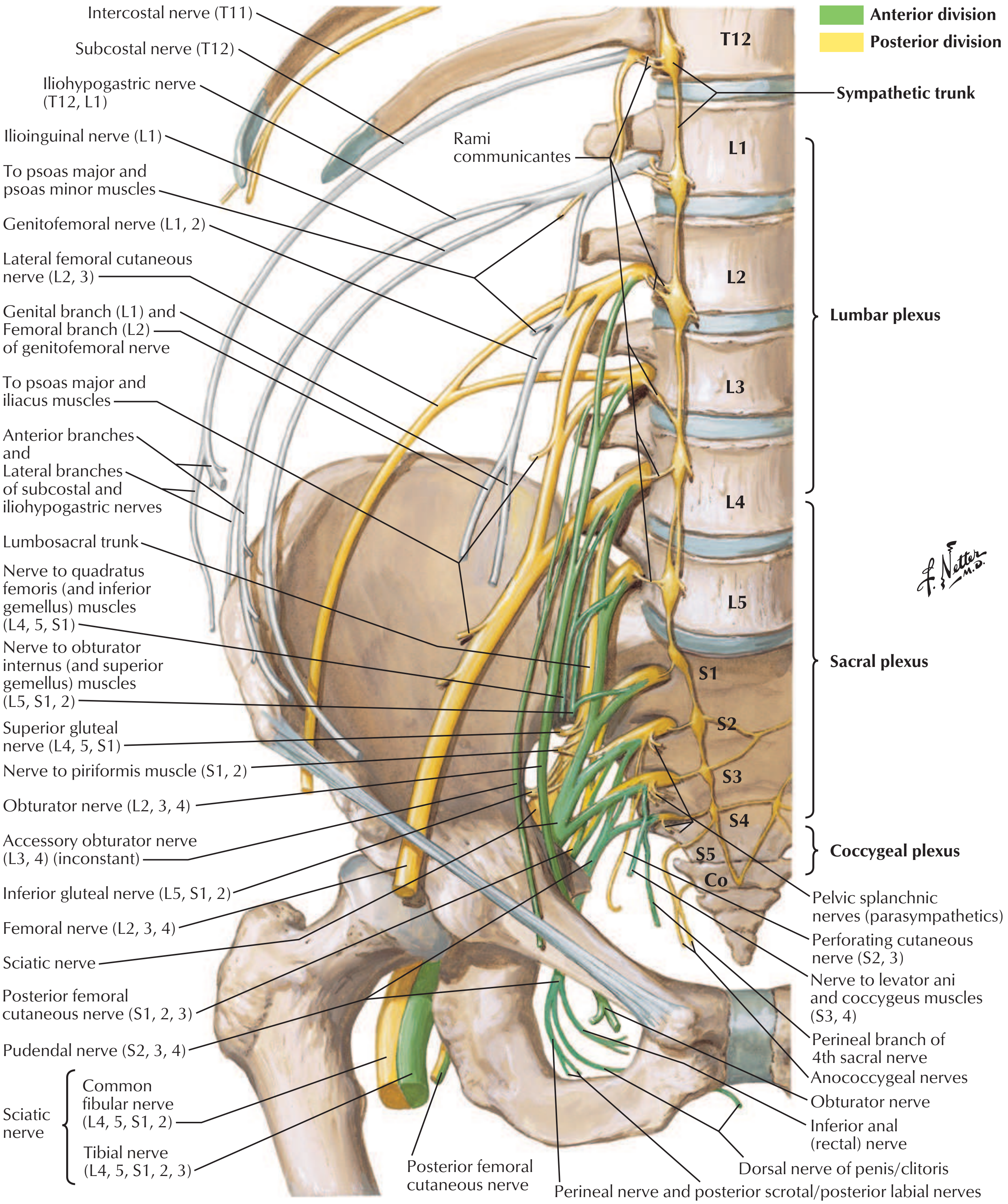
See also **Plates 265, 269**



Subcostal nerve
12th rib
Quadratus lumborum muscle
Transversus abdominis muscle (*cut*)
Iliohypogastric nerve
Ilioinguinal nerve
Psoas minor muscle
Psoas major muscle
Genitofemoral nerve
Lateral femoral cutaneous nerve
Iliacus muscle
Femoral nerve
Obturator nerve
Superior and inferior pubic rami
Greater trochanter of femur
Iliacus and psoas major muscles pass backward to insert on lesser trochanter (iliopsoas muscle)
T12
L1
L2
L3
L4
L5
Origin of psoas major muscle from vertebral bodies, transverse processes, and intervertebral discs (T12–L4) and origin of psoas minor muscle from vertebral bodies (T12, L1)
Lumbar plexus (L1–4)
Lumbosacral trunk (L4, 5)
Iliac crest
Anterior superior iliac spine
Iliopectineal bursa
Iliofemoral ligament of hip joint (Y ligament of Bigelow)
Abductors (gluteus medius and minimus muscles)
Adductors

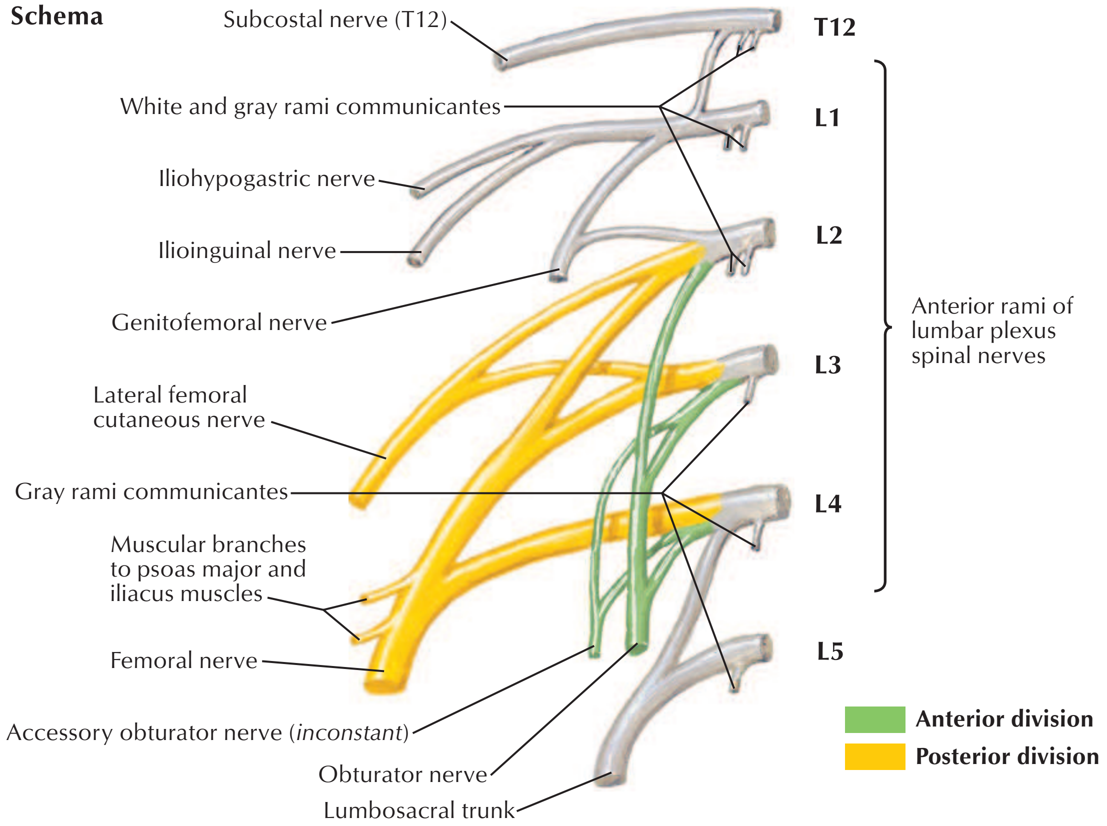
Note: Arrows indicate direction of action of muscles (iliacus/psoas major superiorly, iliopsoas inferiorly).

See also Plate 269

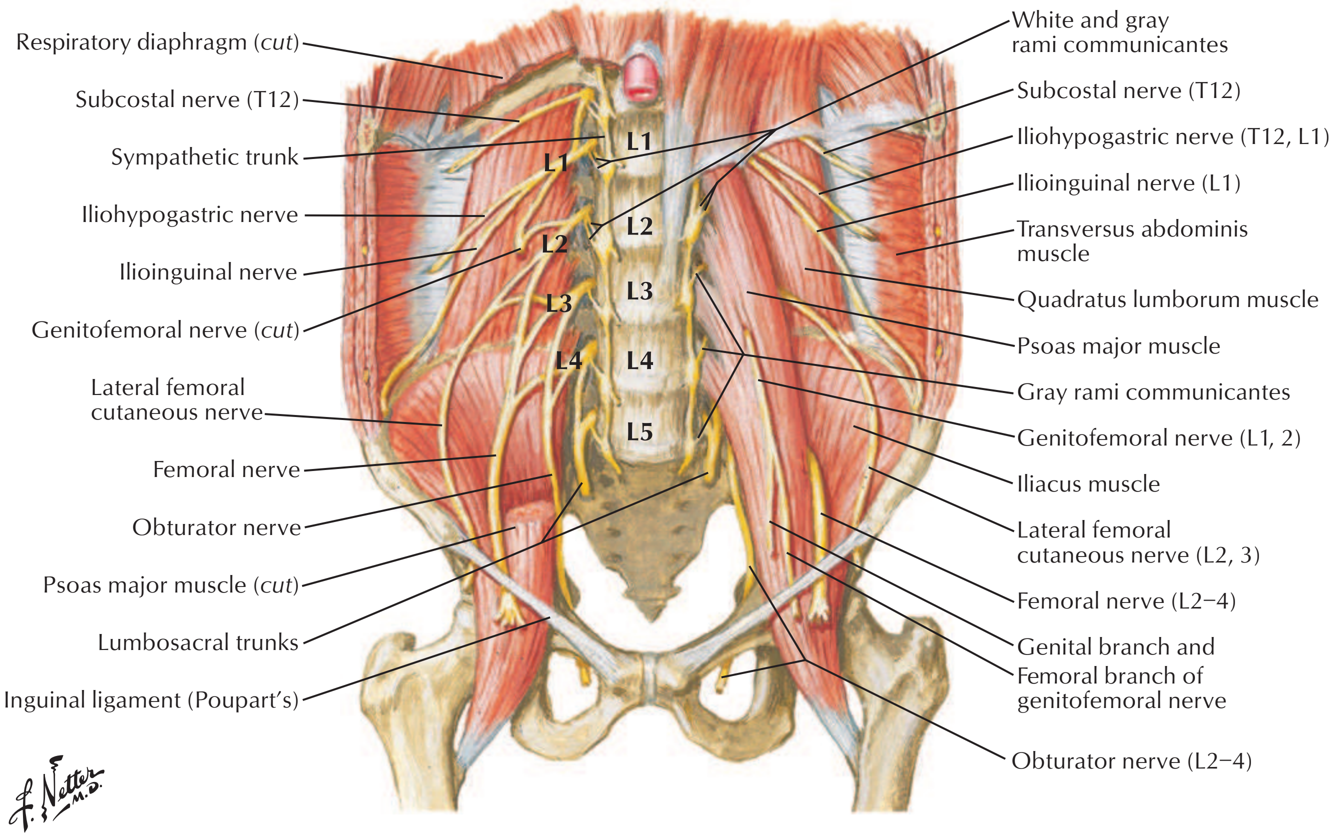

🟩 Anterior division
🟨 Posterior division
Intercostal nerve (T11)
Subcostal nerve (T12)
Iliohypogastric nerve (T12, L1)
Ilioinguinal nerve (L1)
To psoas major and psoas minor muscles
Genitofemoral nerve (L1, 2)
Lateral femoral cutaneous nerve (L2, 3)
Genital branch (L1) and Femoral branch (L2) of genitofemoral nerve
To psoas major and iliacus muscles
Anterior branches and Lateral branches of subcostal and iliohypogastric nerves
Lumbosacral trunk
Nerve to quadratus femoris (and inferior gemellus) muscles (L4, 5, S1)
Nerve to obturator internus (and superior gemellus) muscles (L5, S1, 2)
Superior gluteal nerve (L4, 5, S1)
Nerve to piriformis muscle (S1, 2)
Obturator nerve (L2, 3, 4)
Accessory obturator nerve (L3, 4) (inconstant)
Inferior gluteal nerve (L5, S1, 2)
Femoral nerve (L2, 3, 4)
Sciatic nerve
Posterior femoral cutaneous nerve (S1, 2, 3)
Pudendal nerve (S2, 3, 4)
Sciatic nerve
Common fibular nerve (L4, 5, S1, 2)
Tibial nerve (L4, 5, S1, 2, 3)
Posterior femoral cutaneous nerve
Rami communicantes
T12
L1
L2
L3
L4
L5
S1
S2
S3
S4
S5
Co
Sympathetic trunk
Lumbar plexus
Sacral plexus
Coccygeal plexus
Pelvic splanchnic nerves (parasympathetics)
Perforating cutaneous nerve (S2, 3)
Nerve to levator ani and coccygeus muscles (S3, 4)
Perineal branch of 4th sacral nerve
Anococcygeal nerves
Obturator nerve
Inferior anal (rectal) nerve
Dorsal nerve of penis/clitoris
Perineal nerve and posterior scrotal/posterior labial nerves

Lumbar Plexus

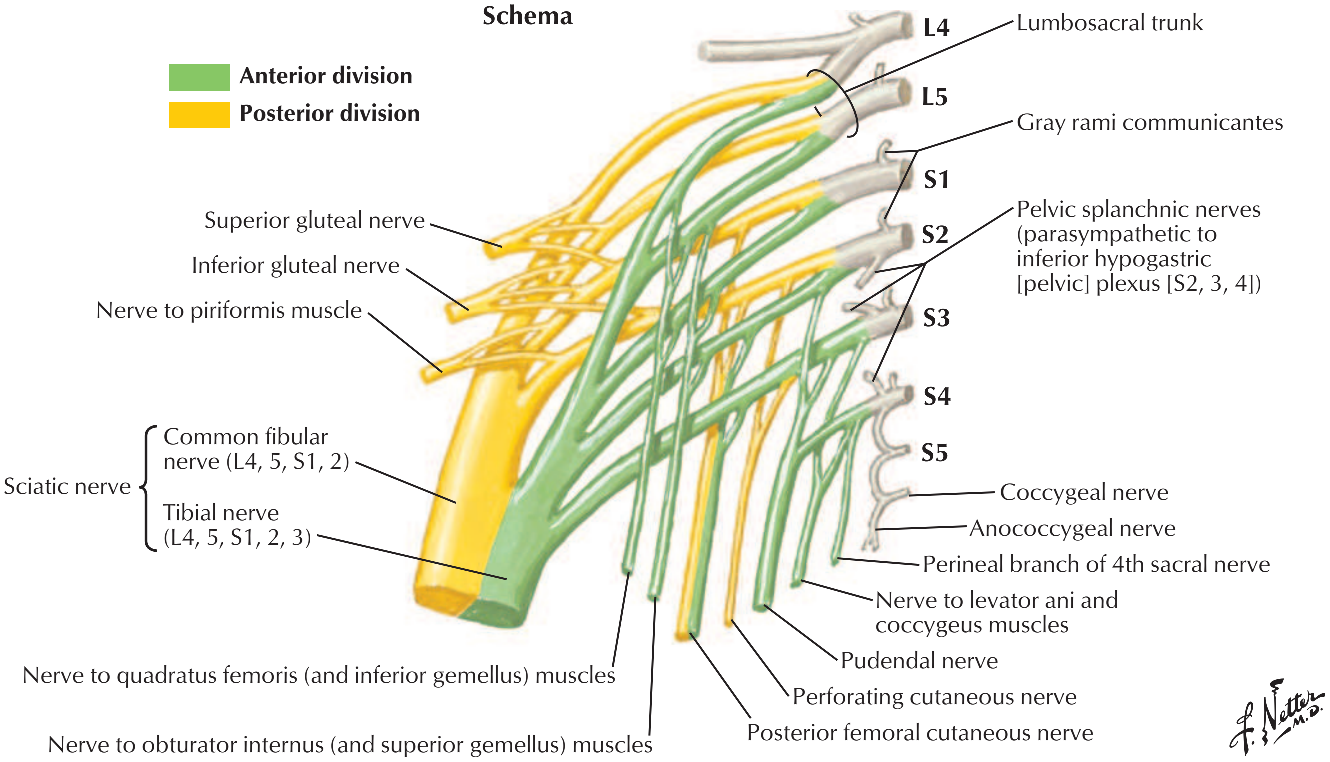
See also **Plate 269**

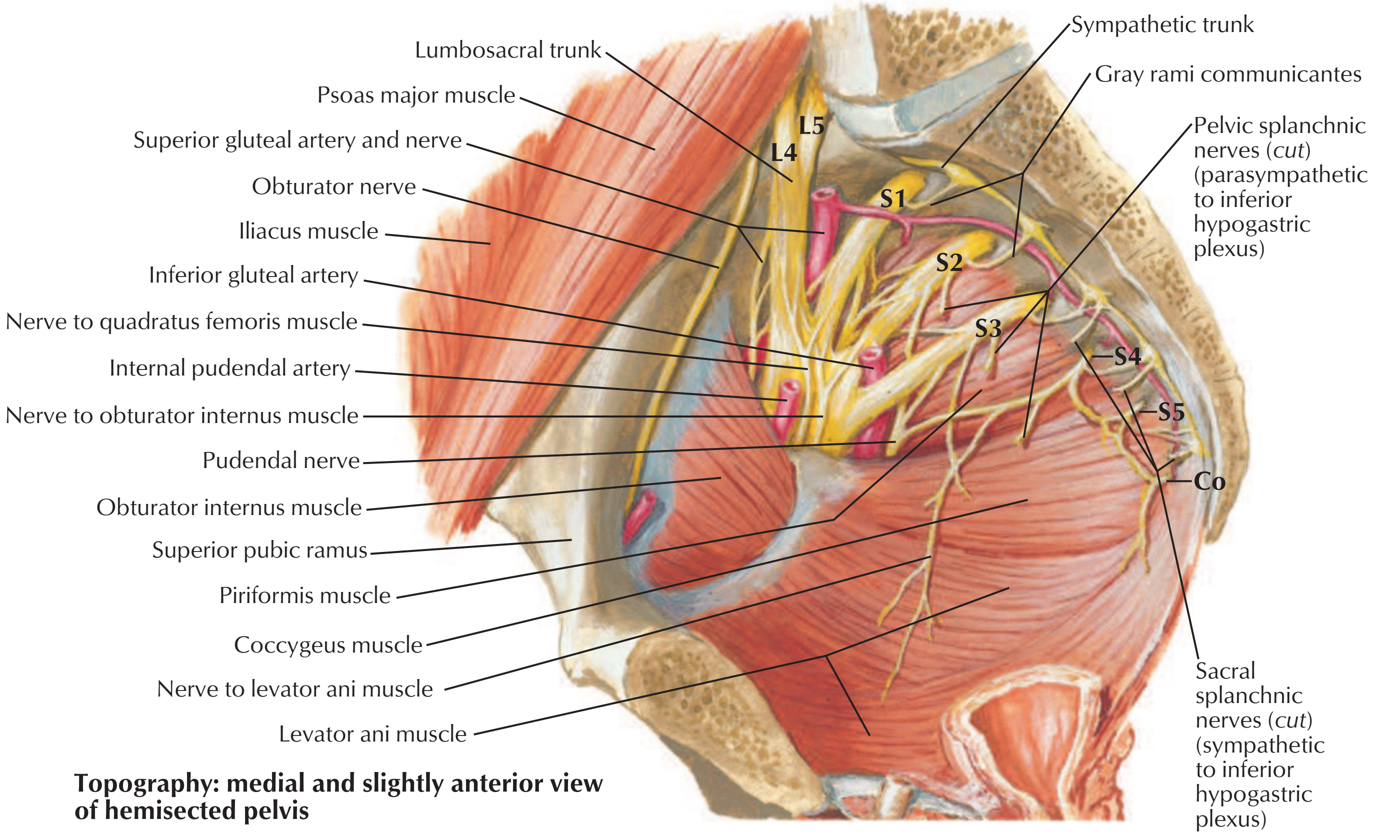

Schema

Subcostal nerve (T12)
T12
White and gray rami communicantes
L1
Iliohypogastric nerve
Ilioinguinal nerve
L2
Genitofemoral nerve
Anterior rami of lumbar plexus spinal nerves
L3
Lateral femoral cutaneous nerve
Gray rami communicantes
L4
Muscular branches to psoas major and iliacus muscles
Femoral nerve
L5
Accessory obturator nerve (*inconstant*)
🟩 Anterior division
🟨 Posterior division
Obturator nerve
Lumbosacral trunk


Respiratory diaphragm (*cut*)
Subcostal nerve (T12)
Sympathetic trunk
Iliohypogastric nerve
Ilioinguinal nerve
Genitofemoral nerve (*cut*)
Lateral femoral cutaneous nerve
Femoral nerve
Obturator nerve
Psoas major muscle (*cut*)
Lumbosacral trunks
Inguinal ligament (Poupart's)
L1
L1
L2
L2
L3
L3
L4
L4
L5
White and gray rami communicantes
Subcostal nerve (T12)
Iliohypogastric nerve (T12, L1)
Ilioinguinal nerve (L1)
Transversus abdominis muscle
Quadratus lumborum muscle
Psoas major muscle
Gray rami communicantes
Genitofemoral nerve (L1, 2)
Iliacus muscle
Lateral femoral cutaneous nerve (L2, 3)
Femoral nerve (L2–4)
Genital branch and Femoral branch of genitofemoral nerve
Obturator nerve (L2–4)

Schema

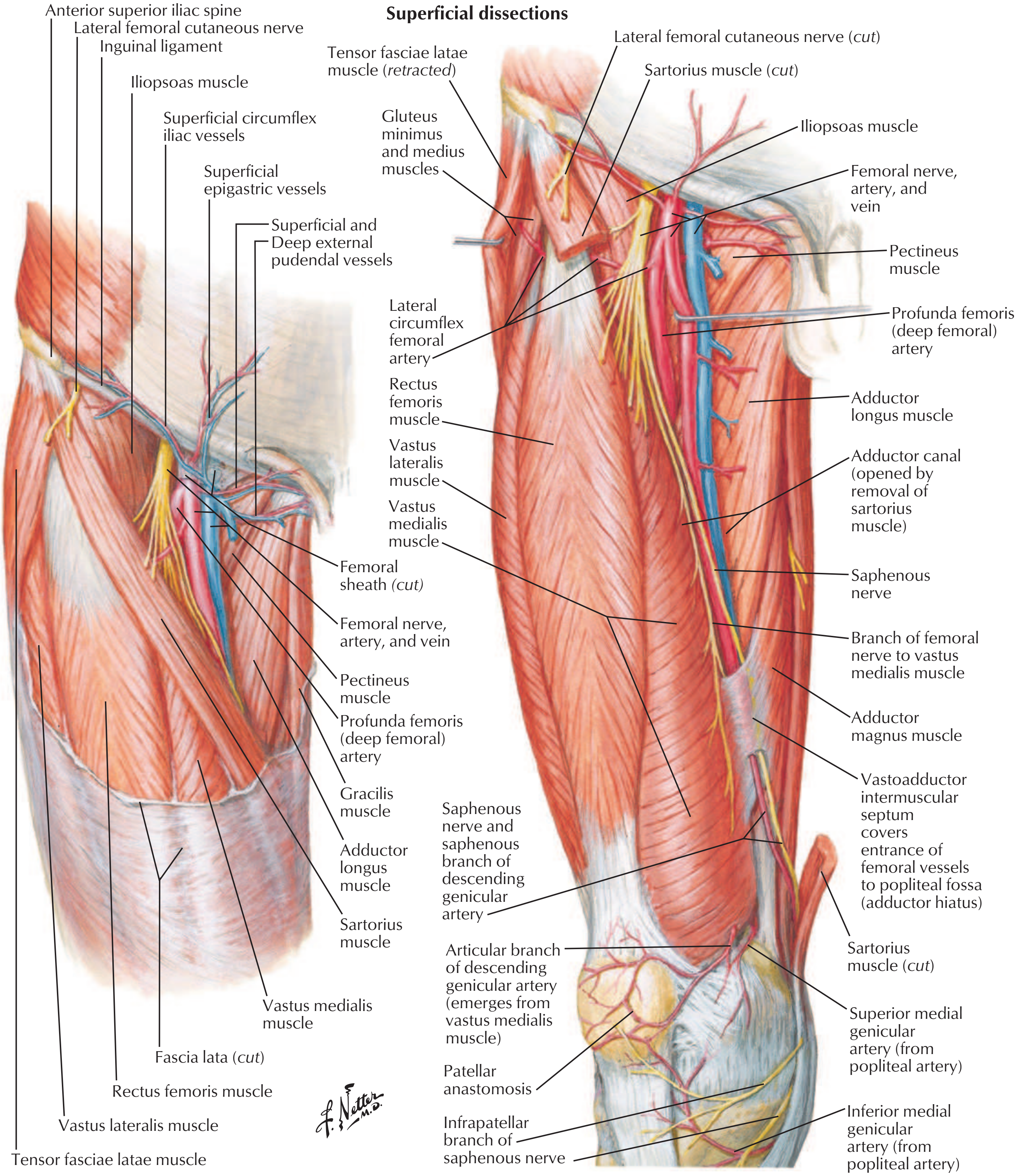

🟩 Anterior division
🟨 Posterior division
L4
Lumbosacral trunk
L5
Gray rami communicantes
S1
Superior gluteal nerve
S2
Pelvic splanchnic nerves (parasympathetic to inferior hypogastric [pelvic] plexus [S2, 3, 4])
Inferior gluteal nerve
S3
Nerve to piriformis muscle
S4
S5
Sciatic nerve
Common fibular nerve (L4, 5, S1, 2)
Tibial nerve (L4, 5, S1, 2, 3)
Coccygeal nerve
Anococcygeal nerve
Perineal branch of 4th sacral nerve
Nerve to levator ani and coccygeus muscles
Pudendal nerve
Perforating cutaneous nerve
Posterior femoral cutaneous nerve
Nerve to quadratus femoris (and inferior gemellus) muscles
Nerve to obturator internus (and superior gemellus) muscles
F. Netter M.D.


Lumbosacral trunk
Psoas major muscle
Superior gluteal artery and nerve
Obturator nerve
Iliacus muscle
Inferior gluteal artery
Nerve to quadratus femoris muscle
Internal pudendal artery
Nerve to obturator internus muscle
Pudendal nerve
Obturator internus muscle
Superior pubic ramus
Piriformis muscle
Coccygeus muscle
Nerve to levator ani muscle
Levator ani muscle
L5
L4
S1
S2
S3
S4
S5
Co
Sympathetic trunk
Gray rami communicantes
Pelvic splanchnic nerves (*cut*) (parasympathetic to inferior hypogastric plexus)
Sacral splanchnic nerves (*cut*) (sympathetic to inferior hypogastric plexus)

Topography: medial and slightly anterior view of hemisected pelvis

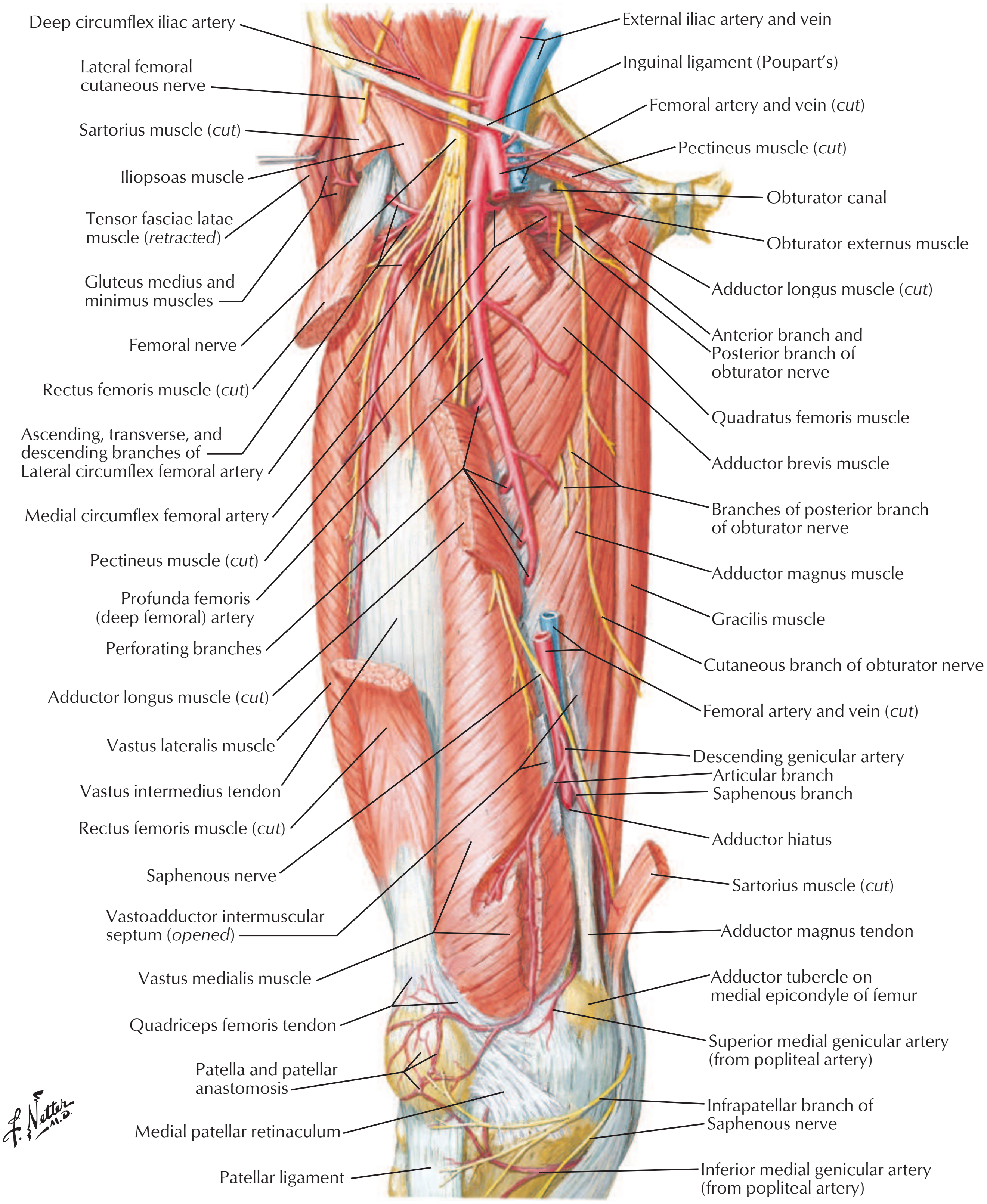
See also **Plates 503**, **529**

Superficial dissections


Anterior superior iliac spine
Lateral femoral cutaneous nerve
Inguinal ligament
Iliopsoas muscle
Superficial circumflex iliac vessels
Superficial epigastric vessels
Superficial and Deep external pudendal vessels
Femoral sheath (*cut*)
Femoral nerve, artery, and vein
Pectineus muscle
Profunda femoris (deep femoral) artery
Gracilis muscle
Adductor longus muscle
Sartorius muscle
Vastus medialis muscle
Fascia lata (*cut*)
Rectus femoris muscle
Vastus lateralis muscle
Tensor fasciae latae muscle
Tensor fasciae latae muscle (*retracted*)
Gluteus minimus and medius muscles
Lateral circumflex femoral artery
Rectus femoris muscle
Vastus lateralis muscle
Vastus medialis muscle
Saphenous nerve and saphenous branch of descending genicular artery
Articular branch of descending genicular artery (emerges from vastus medialis muscle)
Patellar anastomosis
Infrapatellar branch of saphenous nerve
Lateral femoral cutaneous nerve (*cut*)
Sartorius muscle (*cut*)
Iliopsoas muscle
Femoral nerve, artery, and vein
Pectineus muscle
Profunda femoris (deep femoral) artery
Adductor longus muscle
Adductor canal (opened by removal of sartorius muscle)
Saphenous nerve
Branch of femoral nerve to vastus medialis muscle
Adductor magnus muscle
Vastoadductor intermuscular septum covers entrance of femoral vessels to popliteal fossa (adductor hiatus)
Sartorius muscle (*cut*)
Superior medial genicular artery (from popliteal artery)
Inferior medial genicular artery (from popliteal artery)

See also Plates 529, 530

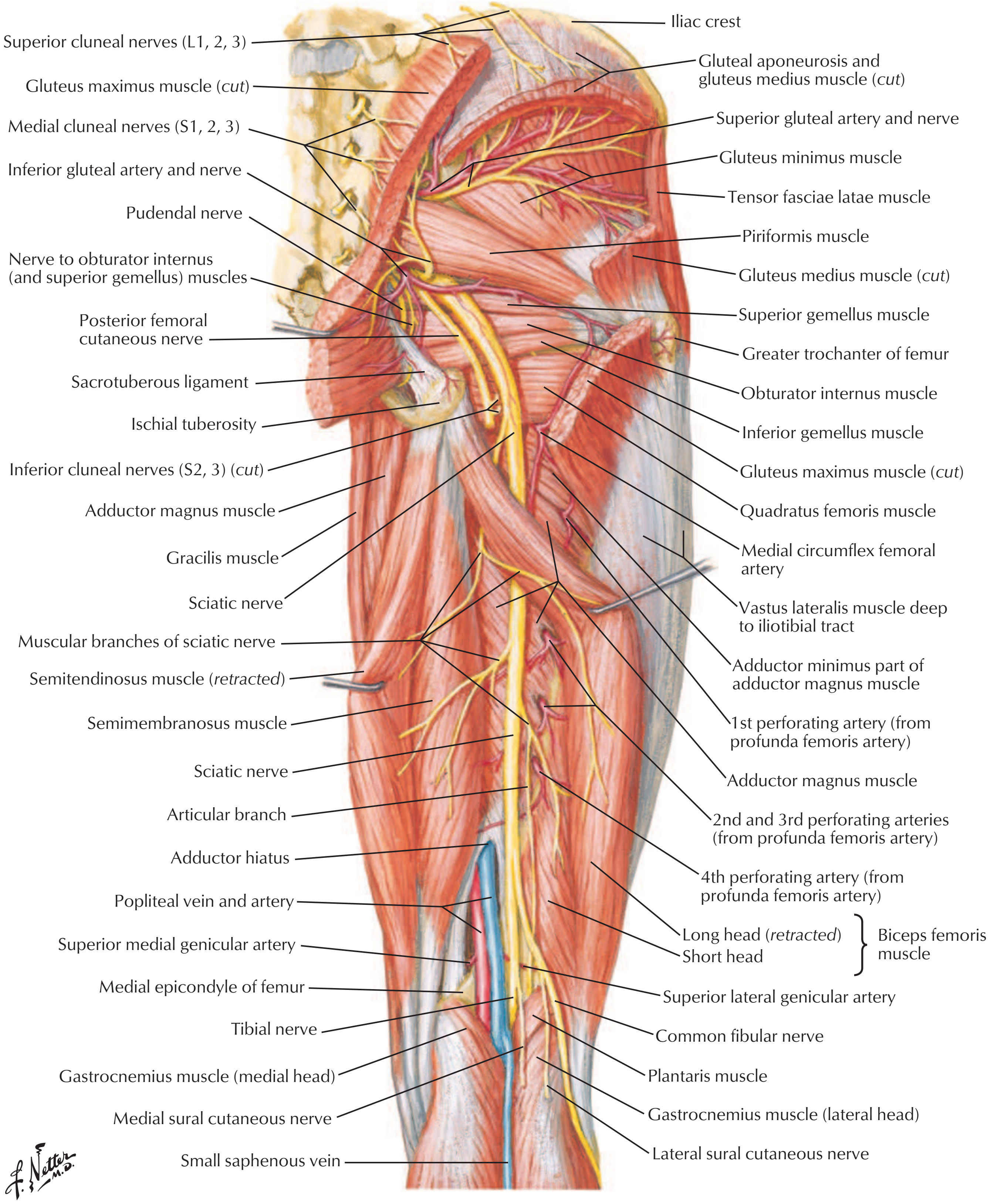
Deep dissection


Deep circumflex iliac artery
Lateral femoral cutaneous nerve
Sartorius muscle (*cut*)
Iliopsoas muscle
Tensor fasciae latae muscle (*retracted*)
Gluteus medius and minimus muscles
Femoral nerve
Rectus femoris muscle (*cut*)
Ascending, transverse, and descending branches of Lateral circumflex femoral artery
Medial circumflex femoral artery
Pectineus muscle (*cut*)
Profunda femoris (deep femoral) artery
Perforating branches
Adductor longus muscle (*cut*)
Vastus lateralis muscle
Vastus intermedius tendon
Rectus femoris muscle (*cut*)
Saphenous nerve
Vastoadductor intermuscular septum (*opened*)
Vastus medialis muscle
Quadriceps femoris tendon
Patella and patellar anastomosis
Medial patellar retinaculum
Patellar ligament
External iliac artery and vein
Inguinal ligament (Poupart's)
Femoral artery and vein (*cut*)
Pectineus muscle (*cut*)
Obturator canal
Obturator externus muscle
Adductor longus muscle (*cut*)
Anterior branch and Posterior branch of obturator nerve
Quadratus femoris muscle
Adductor brevis muscle
Branches of posterior branch of obturator nerve
Adductor magnus muscle
Gracilis muscle
Cutaneous branch of obturator nerve
Femoral artery and vein (*cut*)
Descending genicular artery
Articular branch
Saphenous branch
Adductor hiatus
Sartorius muscle (*cut*)
Adductor magnus tendon
Adductor tubercle on medial epicondyle of femur
Superior medial genicular artery (from popliteal artery)
Infrapatellar branch of Saphenous nerve
Inferior medial genicular artery (from popliteal artery)
F. Netter M.D.

Arteries and Nerves of Thigh: Posterior View

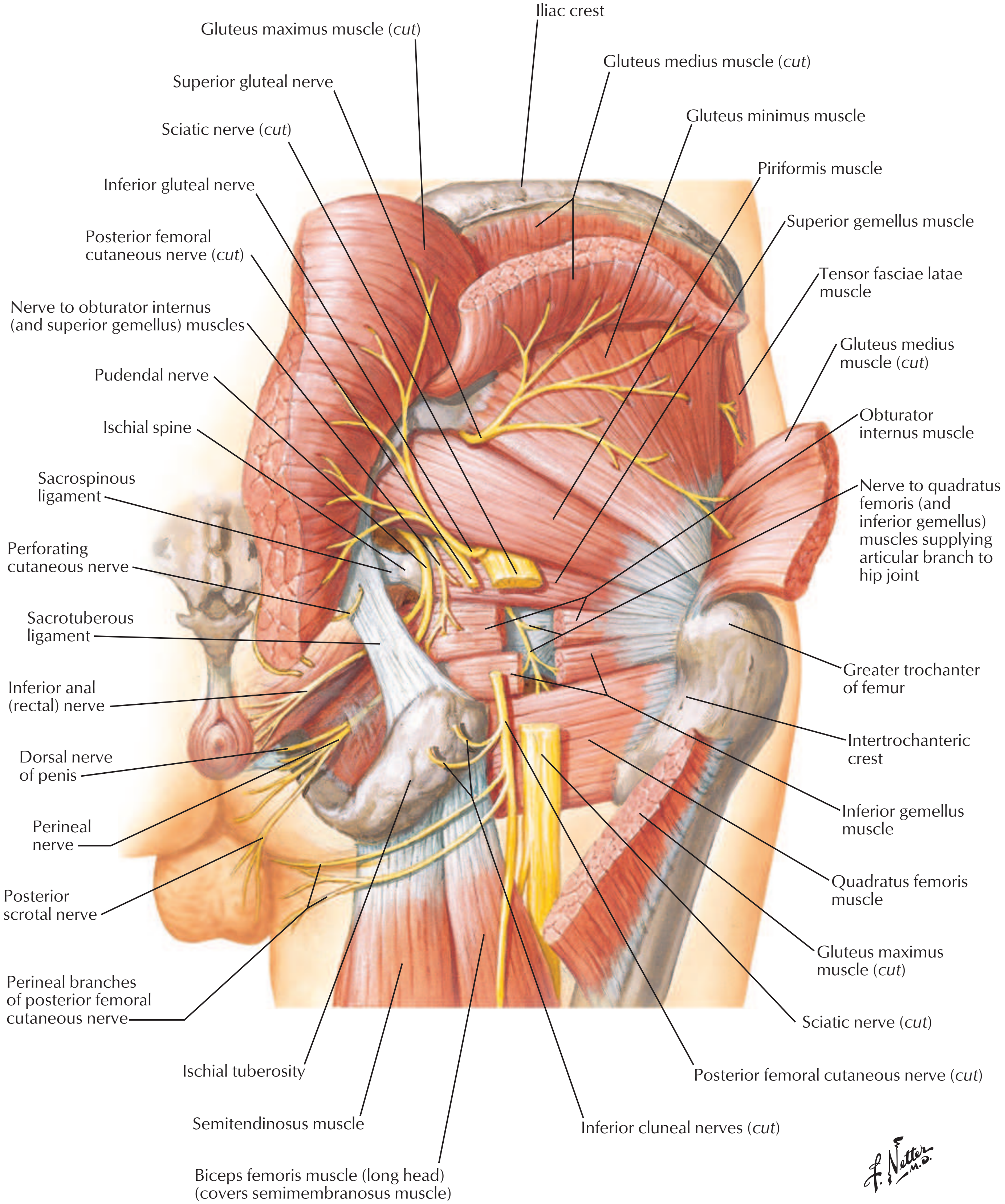
See also Plate 531

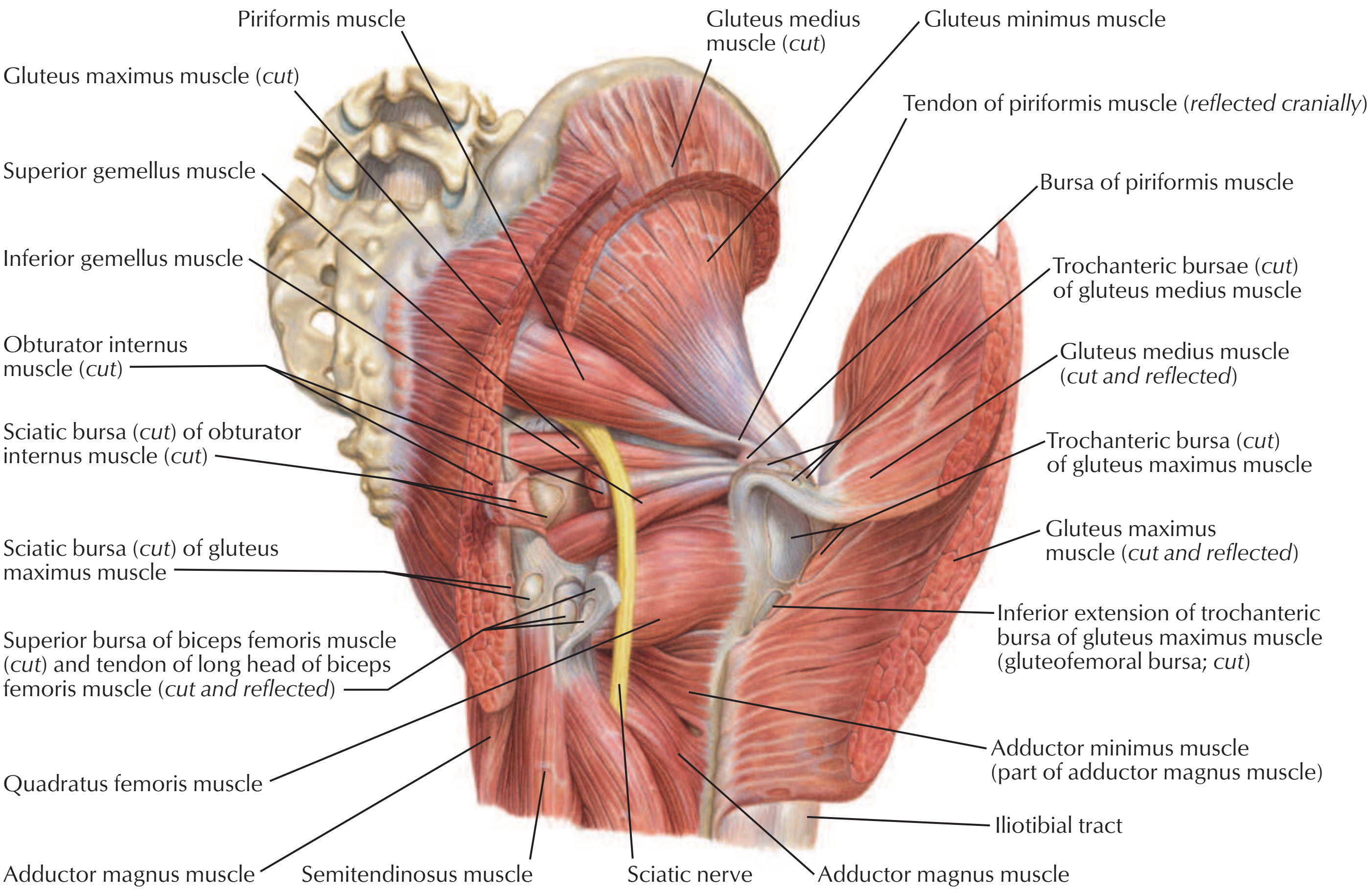
Deep dissection

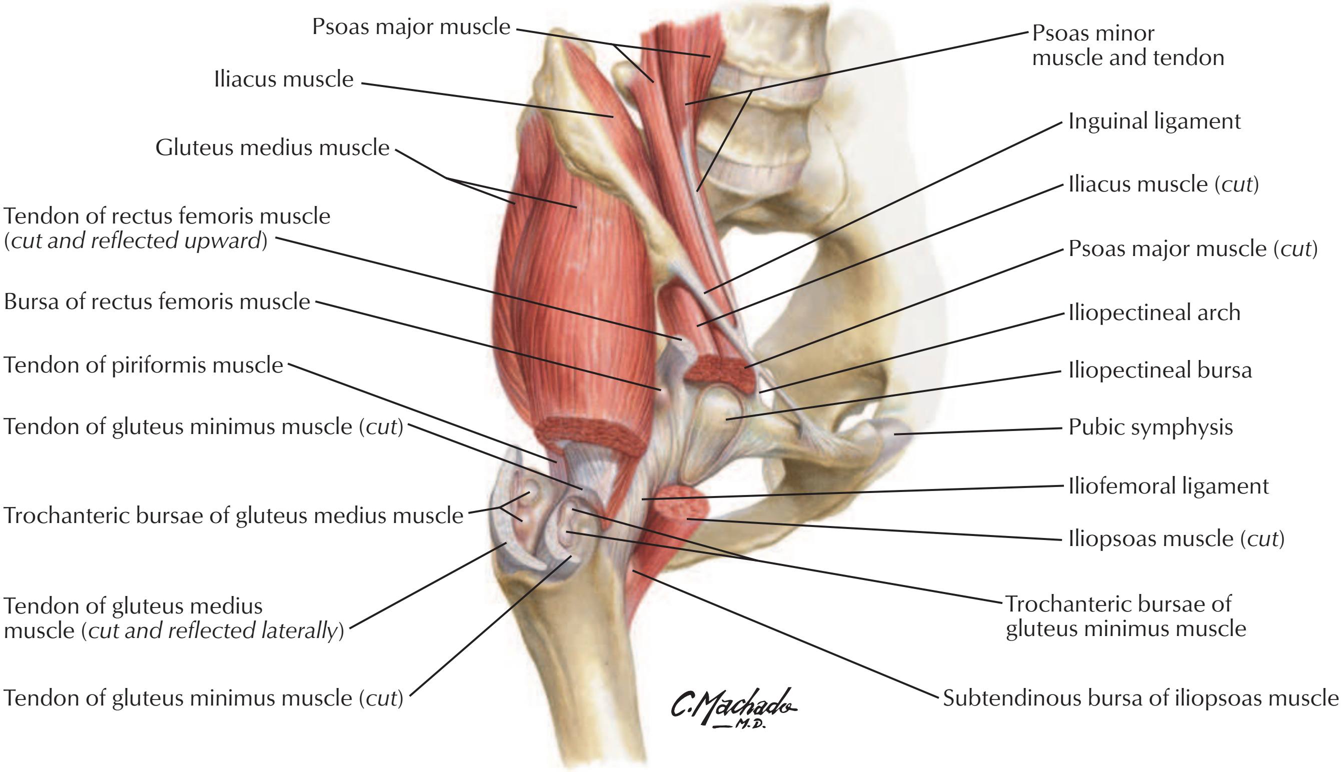

Superior cluneal nerves (L1, 2, 3)
Gluteus maximus muscle (*cut*)
Medial cluneal nerves (S1, 2, 3)
Inferior gluteal artery and nerve
Pudendal nerve
Nerve to obturator internus (and superior gemellus) muscles
Posterior femoral cutaneous nerve
Sacrotuberous ligament
Ischial tuberosity
Inferior cluneal nerves (S2, 3) (*cut*)
Adductor magnus muscle
Gracilis muscle
Sciatic nerve
Muscular branches of sciatic nerve
Semitendinosus muscle (*retracted*)
Semimembranosus muscle
Sciatic nerve
Articular branch
Adductor hiatus
Popliteal vein and artery
Superior medial genicular artery
Medial epicondyle of femur
Tibial nerve
Gastrocnemius muscle (medial head)
Medial sural cutaneous nerve
Small saphenous vein
Iliac crest
Gluteal aponeurosis and gluteus medius muscle (*cut*)
Superior gluteal artery and nerve
Gluteus minimus muscle
Tensor fasciae latae muscle
Piriformis muscle
Gluteus medius muscle (*cut*)
Superior gemellus muscle
Greater trochanter of femur
Obturator internus muscle
Inferior gemellus muscle
Gluteus maximus muscle (*cut*)
Quadratus femoris muscle
Medial circumflex femoral artery
Vastus lateralis muscle deep to iliotibial tract
Adductor minimus part of adductor magnus muscle
1st perforating artery (from profunda femoris artery)
Adductor magnus muscle
2nd and 3rd perforating arteries (from profunda femoris artery)
4th perforating artery (from profunda femoris artery)
Long head (*retracted*)
Short head
Biceps femoris muscle
Superior lateral genicular artery
Common fibular nerve
Plantaris muscle
Gastrocnemius muscle (lateral head)
Lateral sural cutaneous nerve
F. Netter M.D.

Nerves of Hip and Buttock

See also Plate 337

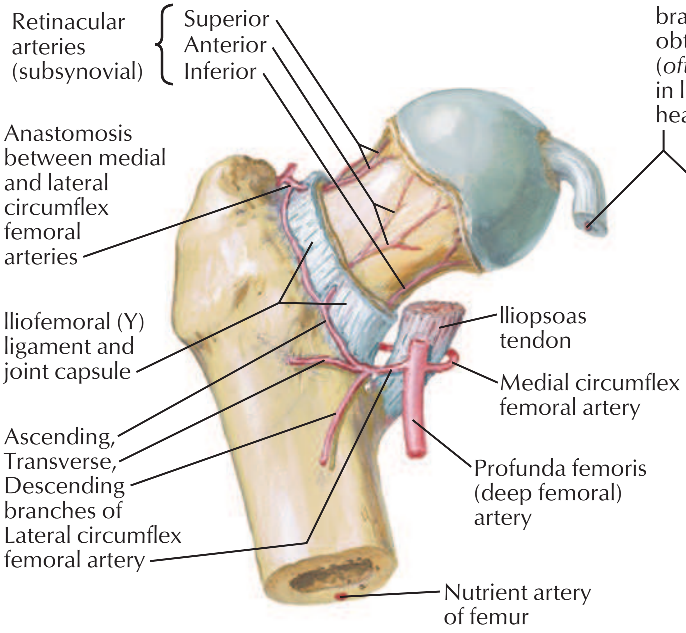

Gluteus maximus muscle (*cut*)
Iliac crest
Superior gluteal nerve
Gluteus medius muscle (*cut*)
Sciatic nerve (*cut*)
Gluteus minimus muscle
Inferior gluteal nerve
Piriformis muscle
Superior gemellus muscle
Posterior femoral cutaneous nerve (*cut*)
Tensor fasciae latae muscle
Nerve to obturator internus (and superior gemellus) muscles
Gluteus medius muscle (*cut*)
Pudendal nerve
Obturator internus muscle
Ischial spine
Sacrospinous ligament
Nerve to quadratus femoris (and inferior gemellus) muscles supplying articular branch to hip joint
Perforating cutaneous nerve
Sacrotuberous ligament
Greater trochanter of femur
Inferior anal (rectal) nerve
Intertrochanteric crest
Dorsal nerve of penis
Inferior gemellus muscle
Perineal nerve
Quadratus femoris muscle
Posterior scrotal nerve
Gluteus maximus muscle (*cut*)
Perineal branches of posterior femoral cutaneous nerve
Sciatic nerve (*cut*)
Ischial tuberosity
Posterior femoral cutaneous nerve (*cut*)
Semitendinosus muscle
Inferior cluneal nerves (*cut*)
Biceps femoris muscle (long head) (covers semimembranosus muscle)
F. Netter M.D.


Piriformis muscle
Gluteus maximus muscle (*cut*)
Gluteus medius muscle (*cut*)
Gluteus minimus muscle
Tendon of piriformis muscle (*reflected cranially*)
Superior gemellus muscle
Bursa of piriformis muscle
Inferior gemellus muscle
Trochanteric bursae (*cut*) of gluteus medius muscle
Obturator internus muscle (*cut*)
Gluteus medius muscle (*cut and reflected*)
Sciatic bursa (*cut*) of obturator internus muscle (*cut*)
Trochanteric bursa (*cut*) of gluteus maximus muscle
Sciatic bursa (*cut*) of gluteus maximus muscle
Gluteus maximus muscle (*cut and reflected*)
Inferior extension of trochanteric bursa of gluteus maximus muscle (gluteofemoral bursa; *cut*)
Superior bursa of biceps femoris muscle (*cut*) and tendon of long head of biceps femoris muscle (*cut and reflected*)
Adductor minimus muscle (part of adductor magnus muscle)
Quadratus femoris muscle
Iliotibial tract
Adductor magnus muscle
Semitendinosus muscle
Sciatic nerve
Adductor magnus muscle

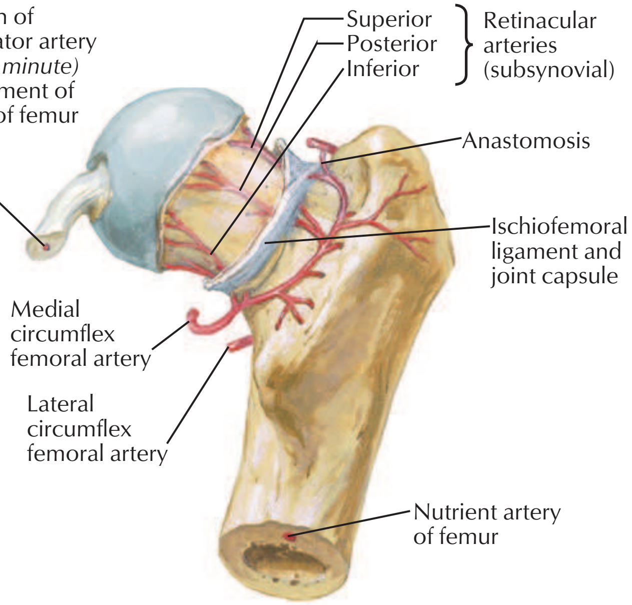

Psoas major muscle
Psoas minor muscle and tendon
Iliacus muscle
Inguinal ligament
Gluteus medius muscle
Iliacus muscle (*cut*)
Tendon of rectus femoris muscle (*cut and reflected upward*)
Psoas major muscle (*cut*)
Bursa of rectus femoris muscle
Iliopectineal arch
Tendon of piriformis muscle
Iliopectineal bursa
Tendon of gluteus minimus muscle (*cut*)
Pubic symphysis
Iliofemoral ligament
Trochanteric bursae of gluteus medius muscle
Iliopsoas muscle (*cut*)
Trochanteric bursae of gluteus minimus muscle
Tendon of gluteus medius muscle (*cut and reflected laterally*)
Tendon of gluteus minimus muscle (*cut*)
C.Machado M.D.
Subtendinous bursa of iliopsoas muscle

See also Plates 477, 503

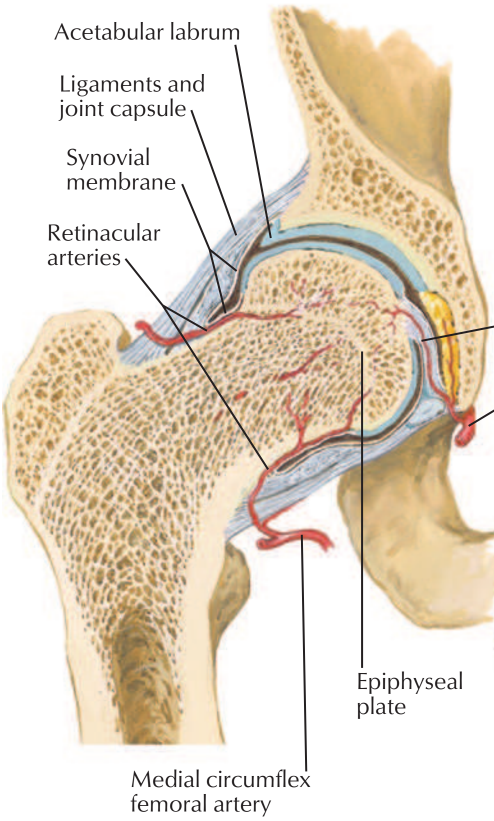
Anterior view


Retinacular arteries (subsynovial)
Superior
Anterior
Inferior
Acetabular branch of obturator artery (*often minute*) in ligament of head of femur
Anastomosis between medial and lateral circumflex femoral arteries
Iliofemoral (Y) ligament and joint capsule
Iliopsoas tendon
Medial circumflex femoral artery
Ascending, Transverse, Descending branches of Lateral circumflex femoral artery
Profunda femoris (deep femoral) artery
Nutrient artery of femur

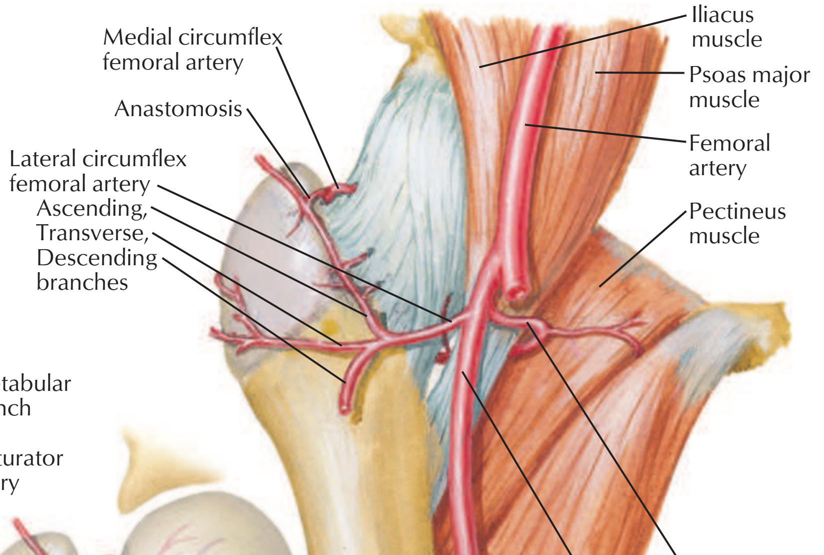
Posterior view

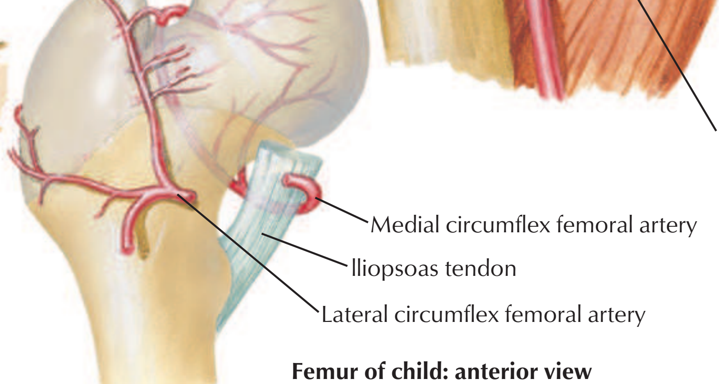

Superior
Posterior
Inferior
Retinacular arteries (subsynovial)
Anastomosis
Ischiofemoral ligament and joint capsule
Medial circumflex femoral artery
Lateral circumflex femoral artery
Nutrient artery of femur

Coronal section


Acetabular labrum
Ligaments and joint capsule
Synovial membrane
Retinacular arteries
Acetabular branch
Obturator artery
Epiphyseal plate
Medial circumflex femoral artery

Anterior view


Medial circumflex femoral artery
Anastomosis
Lateral circumflex femoral artery
Ascending, Transverse, Descending branches
Iliacus muscle
Psoas major muscle
Femoral artery
Pectineus muscle
Medial circumflex femoral artery
Profunda femoris (deep femoral) artery


Medial circumflex femoral artery
Iliopsoas tendon
Lateral circumflex femoral artery

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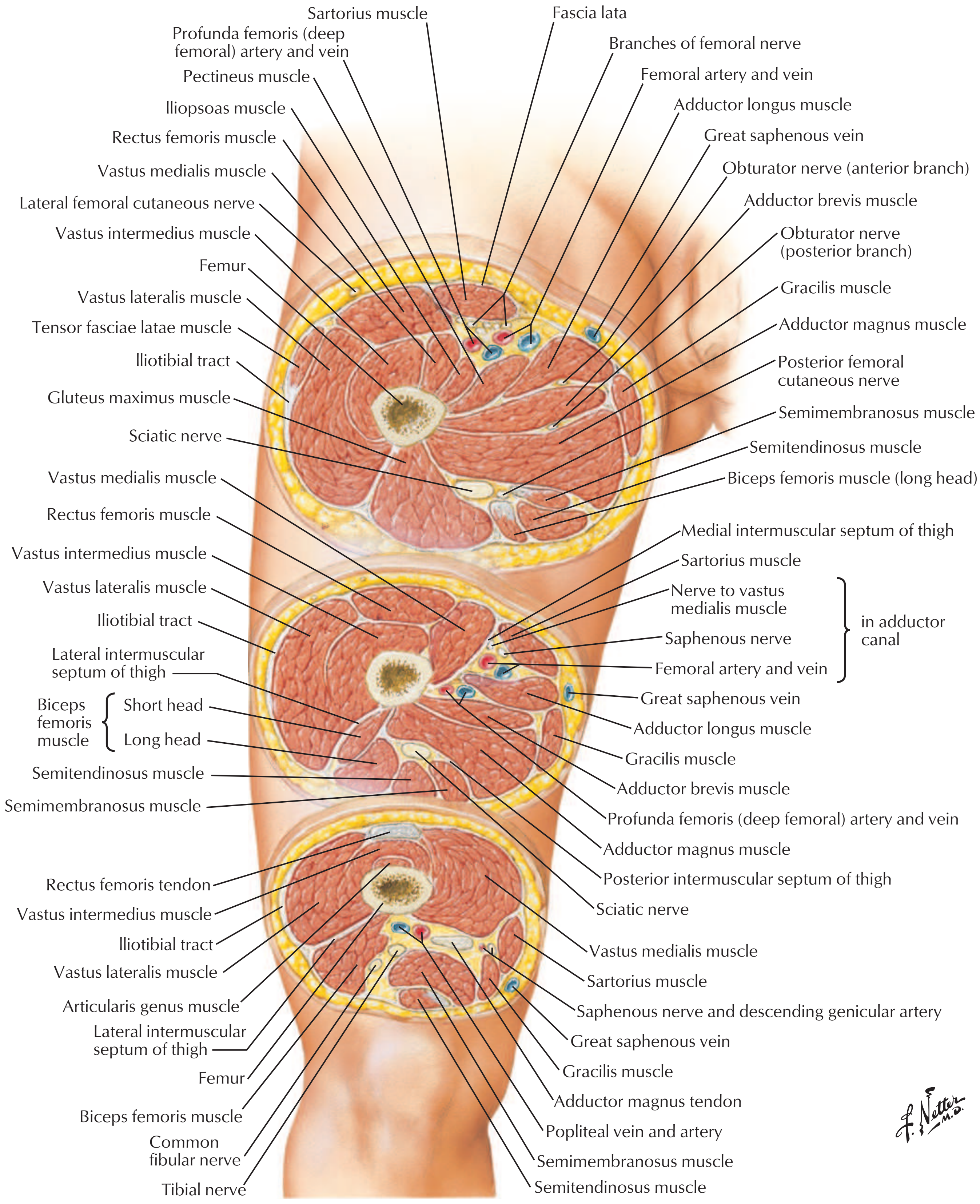
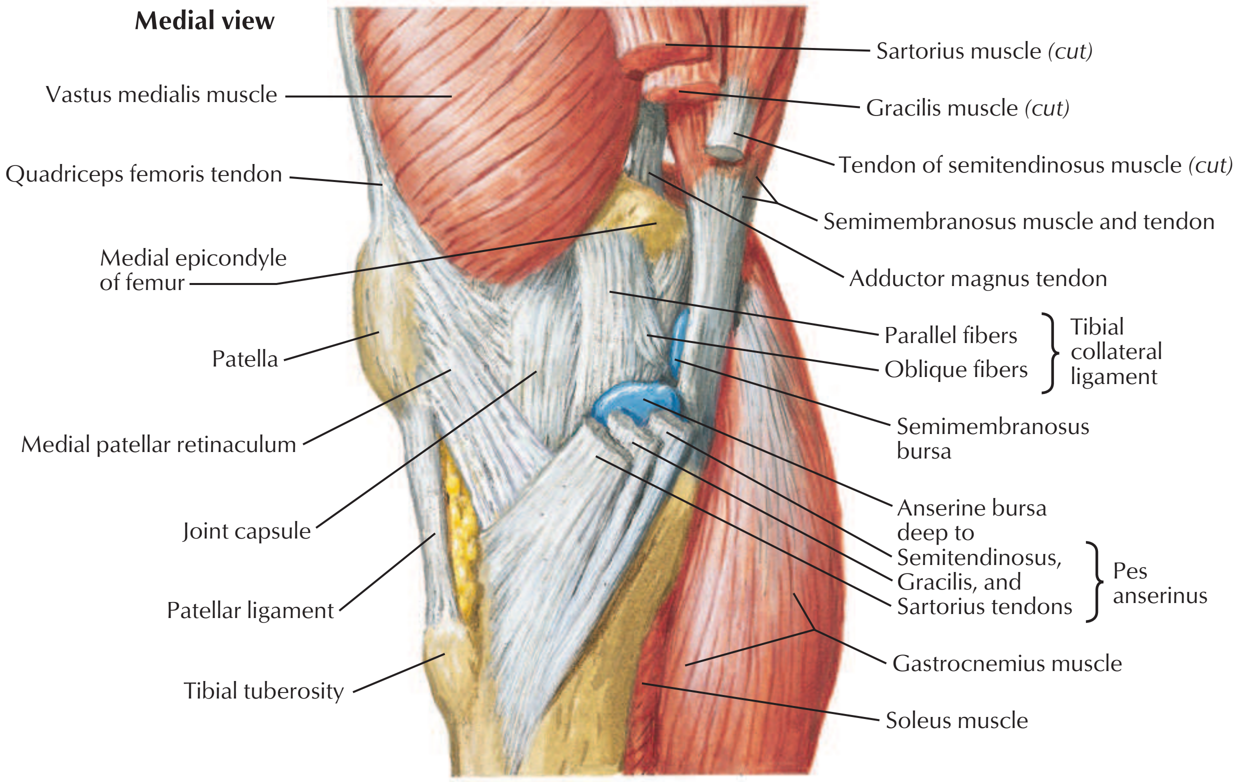
Femur of child: anterior view

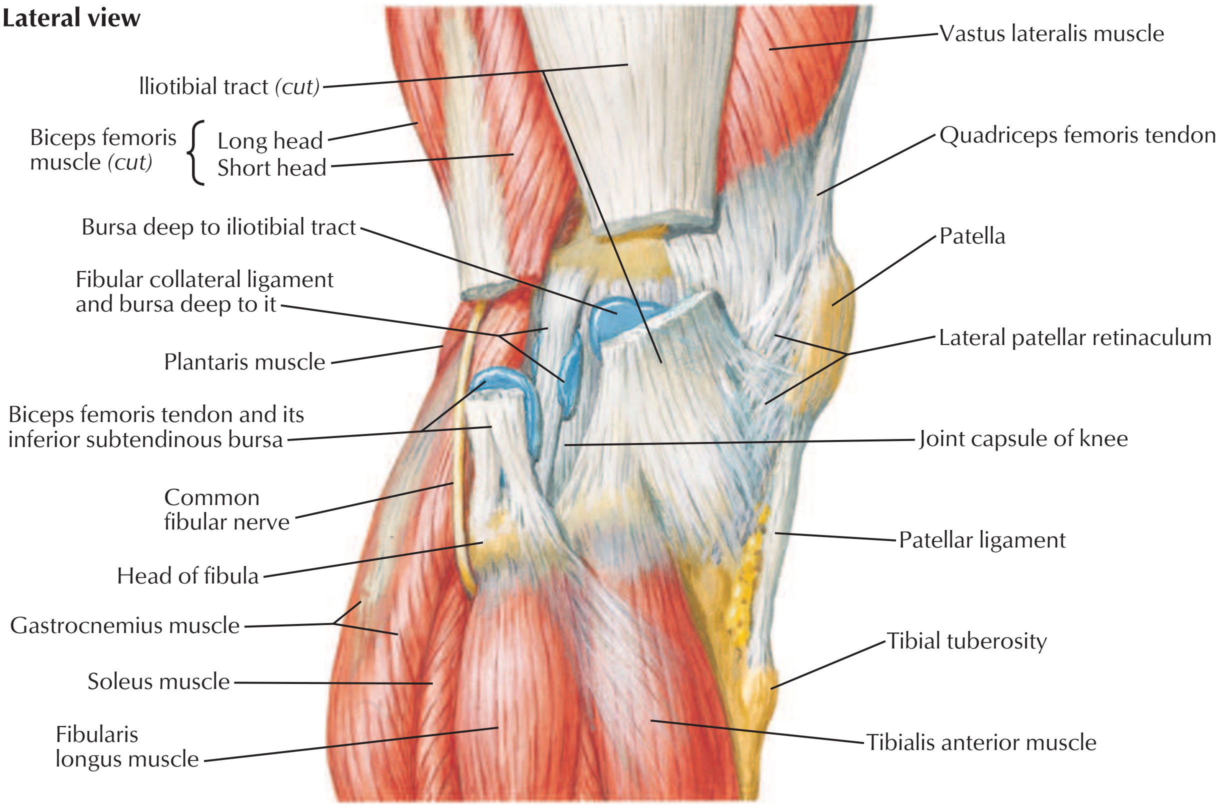
Thigh: Serial Cross Sections


Sartorius muscle
Profunda femoris (deep femoral) artery and vein
Pectineus muscle
Iliopsoas muscle
Rectus femoris muscle
Vastus medialis muscle
Lateral femoral cutaneous nerve
Vastus intermedius muscle
Femur
Vastus lateralis muscle
Tensor fasciae latae muscle
Iliotibial tract
Gluteus maximus muscle
Sciatic nerve
Vastus medialis muscle
Rectus femoris muscle
Vastus intermedius muscle
Vastus lateralis muscle
Iliotibial tract
Lateral intermuscular septum of thigh
Biceps femoris muscle
Short head
Long head
Semitendinosus muscle
Semimembranosus muscle
Rectus femoris tendon
Vastus intermedius muscle
Iliotibial tract
Vastus lateralis muscle
Articularis genus muscle
Lateral intermuscular septum of thigh
Femur
Biceps femoris muscle
Common fibular nerve
Tibial nerve
Fascia lata
Branches of femoral nerve
Femoral artery and vein
Adductor longus muscle
Great saphenous vein
Obturator nerve (anterior branch)
Adductor brevis muscle
Obturator nerve (posterior branch)
Gracilis muscle
Adductor magnus muscle
Posterior femoral cutaneous nerve
Semimembranosus muscle
Semitendinosus muscle
Biceps femoris muscle (long head)
Medial intermuscular septum of thigh
Sartorius muscle
Nerve to vastus medialis muscle
Saphenous nerve
Femoral artery and vein
in adductor canal
Great saphenous vein
Adductor longus muscle
Gracilis muscle
Adductor brevis muscle
Profunda femoris (deep femoral) artery and vein
Adductor magnus muscle
Posterior intermuscular septum of thigh
Sciatic nerve
Vastus medialis muscle
Sartorius muscle
Saphenous nerve and descending genicular artery
Great saphenous vein
Gracilis muscle
Adductor magnus tendon
Popliteal vein and artery
Semimembranosus muscle
Semitendinosus muscle

Medial view


Vastus medialis muscle
Quadriceps femoris tendon
Medial epicondyle of femur
Patella
Medial patellar retinaculum
Joint capsule
Patellar ligament
Tibial tuberosity
Sartorius muscle *(cut)*
Gracilis muscle *(cut)*
Tendon of semitendinosus muscle *(cut)*
Semimembranosus muscle and tendon
Adductor magnus tendon
Parallel fibers
Oblique fibers
Tibial collateral ligament
Semimembranosus bursa
Anserine bursa deep to
Semitendinosus,
Gracilis, and
Sartorius tendons
Pes anserinus
Gastrocnemius muscle
Soleus muscle

Lateral view

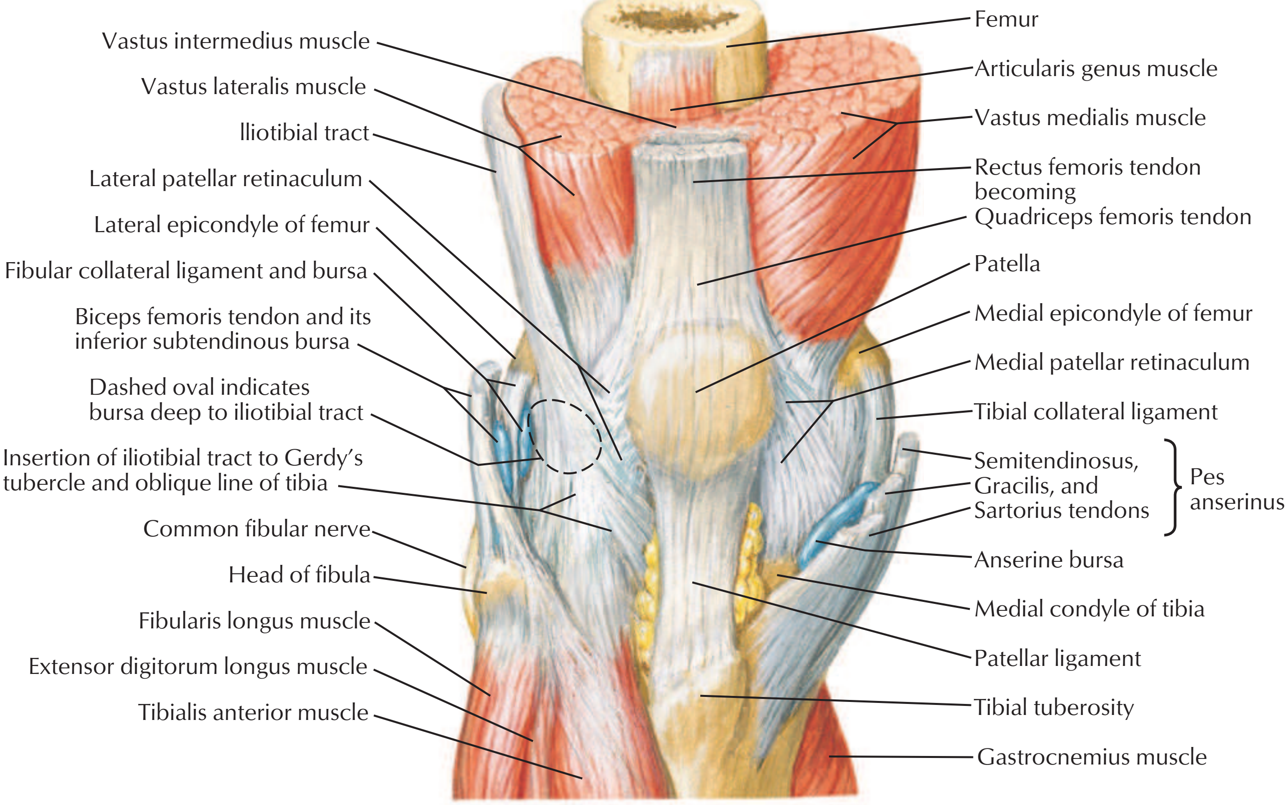

Iliotibial tract *(cut)*
Biceps femoris muscle *(cut)*
Long head
Short head
Bursa deep to iliotibial tract
Fibular collateral ligament and bursa deep to it
Plantaris muscle
Biceps femoris tendon and its inferior subtendinous bursa
Common fibular nerve
Head of fibula
Gastrocnemius muscle
Soleus muscle
Fibularis longus muscle
Vastus lateralis muscle
Quadriceps femoris tendon
Patella
Lateral patellar retinaculum
Joint capsule of knee
Patellar ligament
Tibial tuberosity
Tibialis anterior muscle

F. Netter M.D.

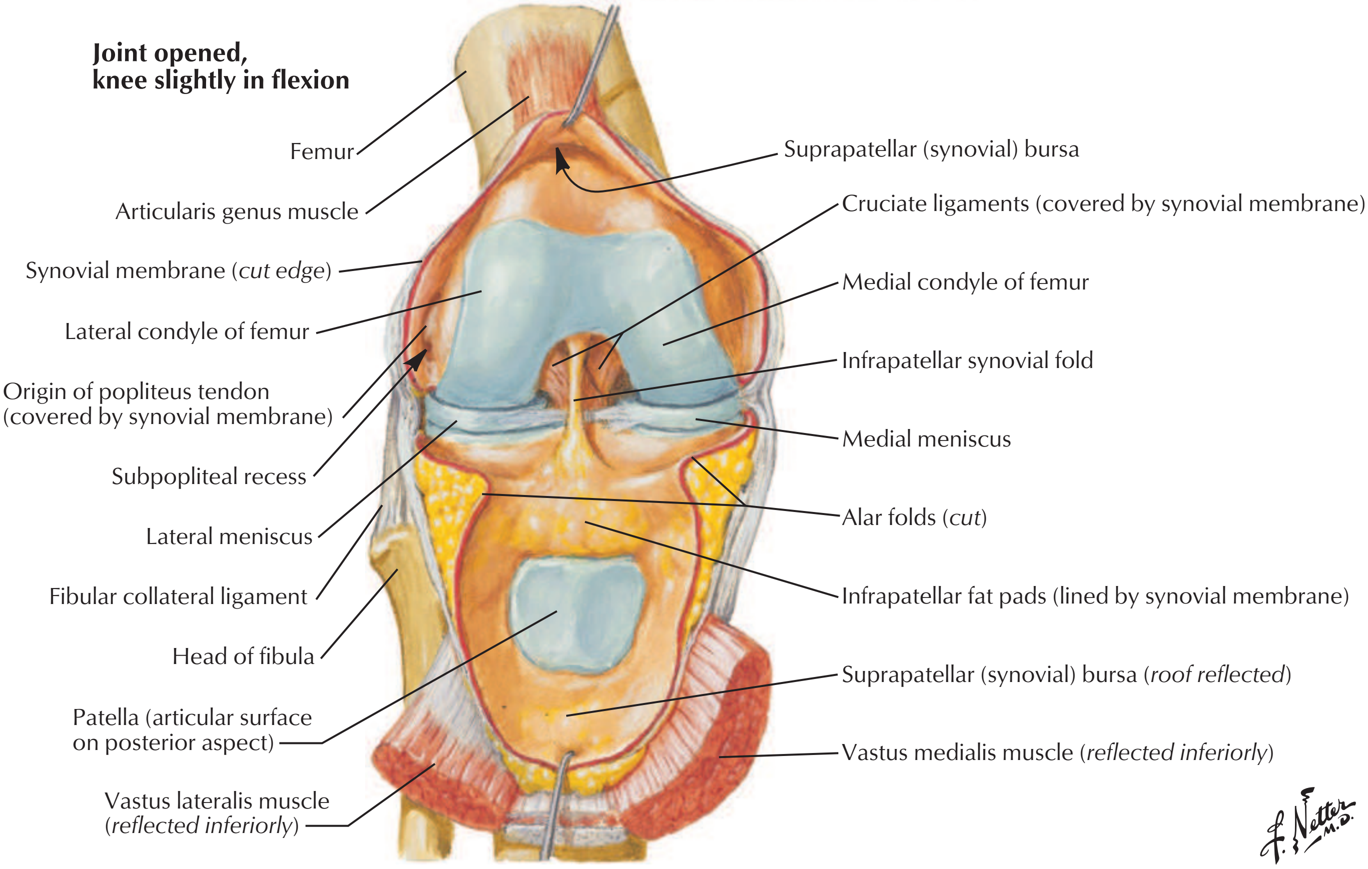
Knee: Anterior Views

See also Plate 501

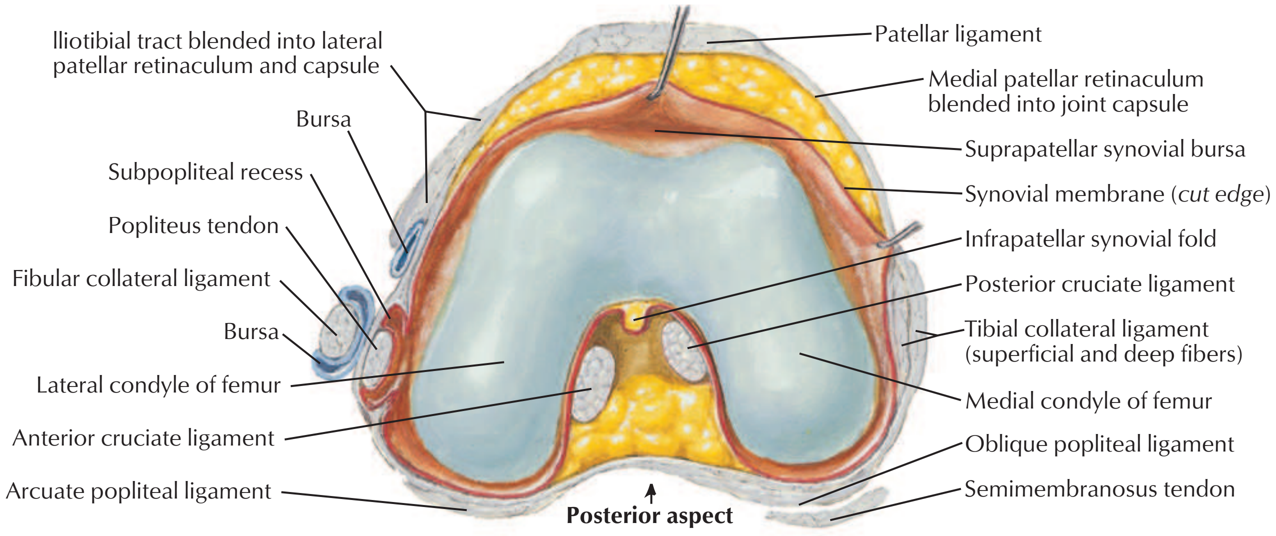
Right knee in extension


Vastus intermedius muscle
Vastus lateralis muscle
Iliotibial tract
Lateral patellar retinaculum
Lateral epicondyle of femur
Fibular collateral ligament and bursa
Biceps femoris tendon and its inferior subtendinous bursa
Dashed oval indicates bursa deep to iliotibial tract
Insertion of iliotibial tract to Gerdy's tubercle and oblique line of tibia
Common fibular nerve
Head of fibula
Fibularis longus muscle
Extensor digitorum longus muscle
Tibialis anterior muscle
Femur
Articularis genus muscle
Vastus medialis muscle
Rectus femoris tendon becoming Quadriceps femoris tendon
Patella
Medial epicondyle of femur
Medial patellar retinaculum
Tibial collateral ligament
Semitendinosus, Gracilis, and Sartorius tendons
Pes anserinus
Anserine bursa
Medial condyle of tibia
Patellar ligament
Tibial tuberosity
Gastrocnemius muscle

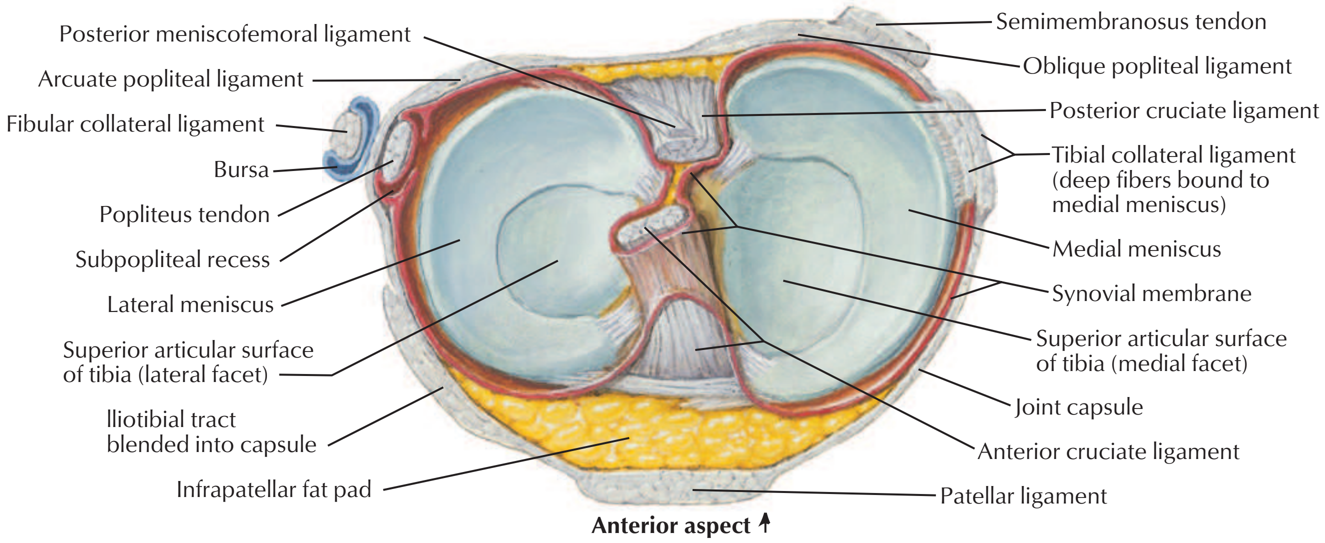
Joint opened, knee slightly in flexion


Femur
Articularis genus muscle
Synovial membrane (*cut edge*)
Lateral condyle of femur
Origin of popliteus tendon (covered by synovial membrane)
Subpopliteal recess
Lateral meniscus
Fibular collateral ligament
Head of fibula
Patella (articular surface on posterior aspect)
Vastus lateralis muscle (*reflected inferiorly*)
Suprapatellar (synovial) bursa
Cruciate ligaments (covered by synovial membrane)
Medial condyle of femur
Infrapatellar synovial fold
Medial meniscus
Alar folds (*cut*)
Infrapatellar fat pads (lined by synovial membrane)
Suprapatellar (synovial) bursa (*roof reflected*)
Vastus medialis muscle (*reflected inferiorly*)

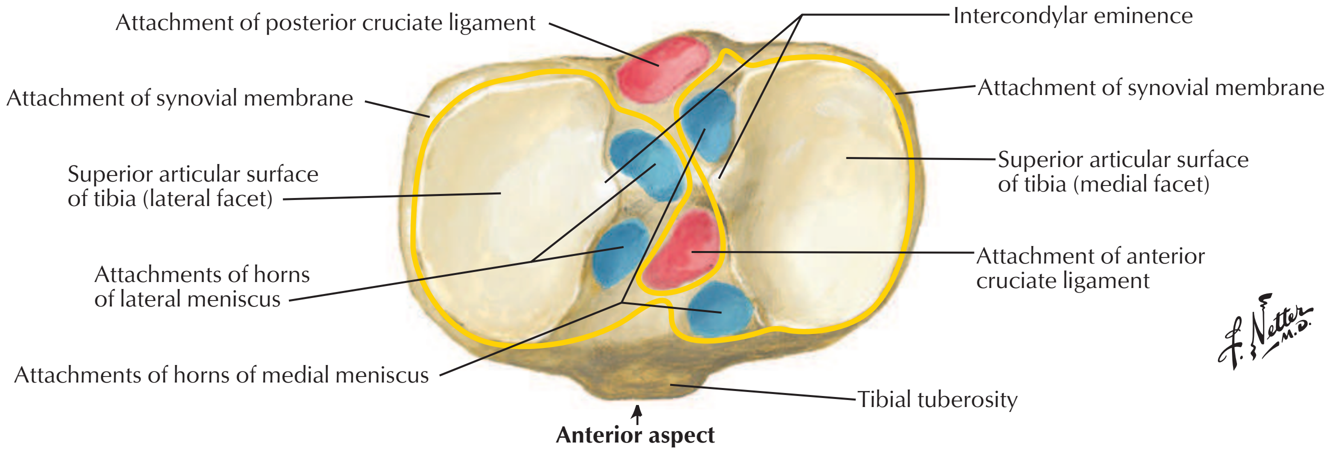
Inferior view


Iliotibial tract blended into lateral patellar retinaculum and capsule
Bursa
Subpopliteal recess
Popliteus tendon
Fibular collateral ligament
Bursa
Lateral condyle of femur
Anterior cruciate ligament
Arcuate popliteal ligament
Posterior aspect
Patellar ligament
Medial patellar retinaculum blended into joint capsule
Suprapatellar synovial bursa
Synovial membrane (cut edge)
Infrapatellar synovial fold
Posterior cruciate ligament
Tibial collateral ligament (superficial and deep fibers)
Medial condyle of femur
Oblique popliteal ligament
Semimembranosus tendon

Superior view

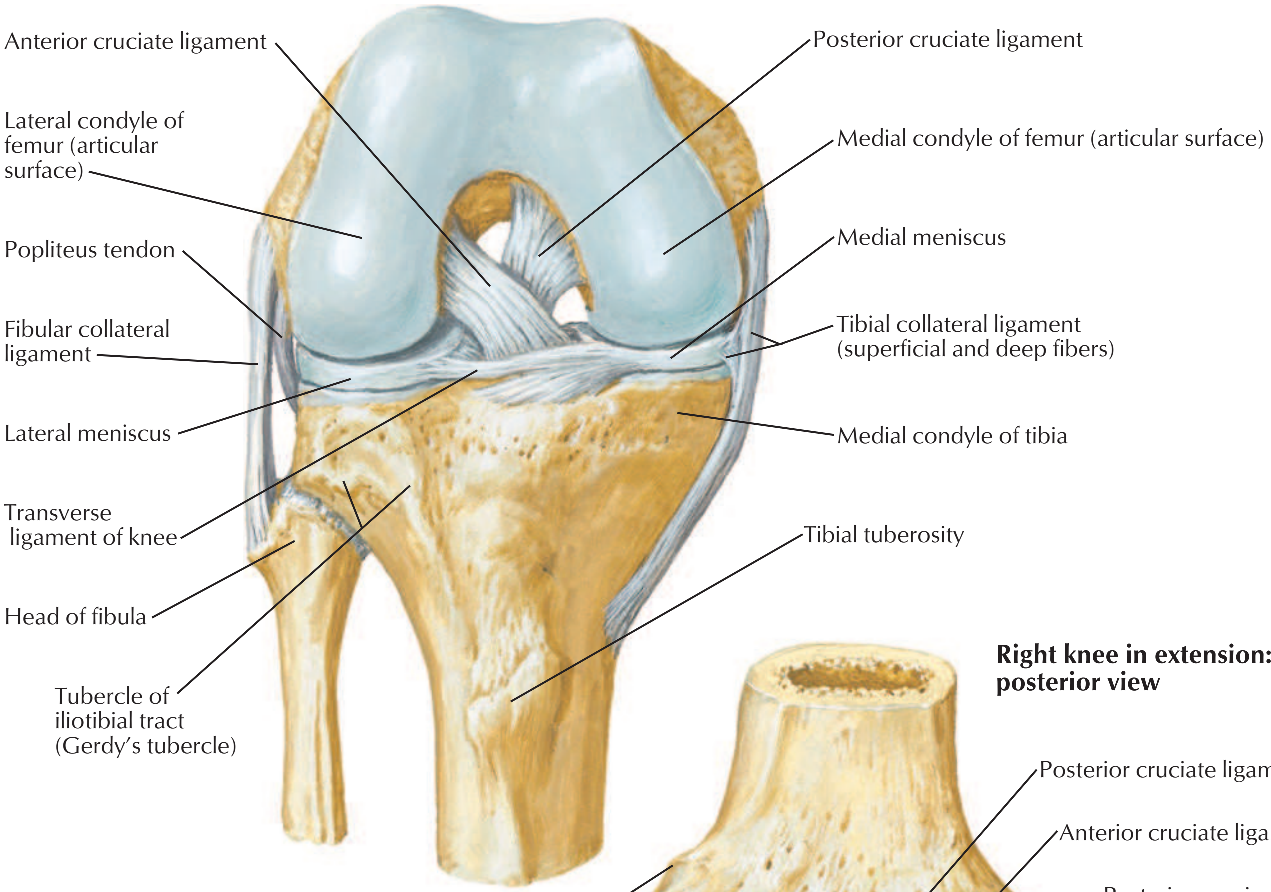

Posterior meniscofemoral ligament
Arcuate popliteal ligament
Fibular collateral ligament
Bursa
Popliteus tendon
Subpopliteal recess
Lateral meniscus
Superior articular surface of tibia (lateral facet)
Iliotibial tract blended into capsule
Infrapatellar fat pad
Anterior aspect
Semimembranosus tendon
Oblique popliteal ligament
Posterior cruciate ligament
Tibial collateral ligament (deep fibers bound to medial meniscus)
Medial meniscus
Synovial membrane
Superior articular surface of tibia (medial facet)
Joint capsule
Anterior cruciate ligament
Patellar ligament

Superior view: ligaments and cartilage removed

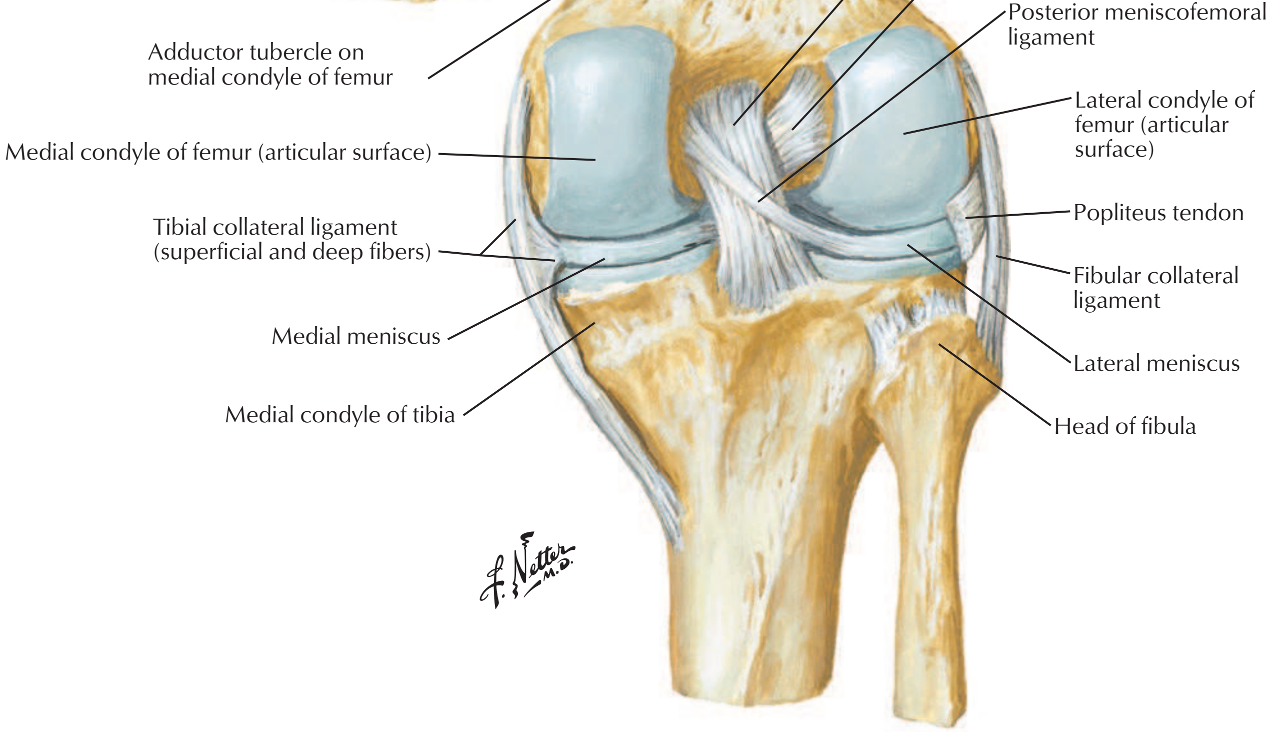

Attachment of posterior cruciate ligament
Attachment of synovial membrane
Superior articular surface of tibia (lateral facet)
Attachments of horns of lateral meniscus
Attachments of horns of medial meniscus
Anterior aspect
Intercondylar eminence
Attachment of synovial membrane
Superior articular surface of tibia (medial facet)
Attachment of anterior cruciate ligament
Tibial tuberosity

F. Netter M.D.

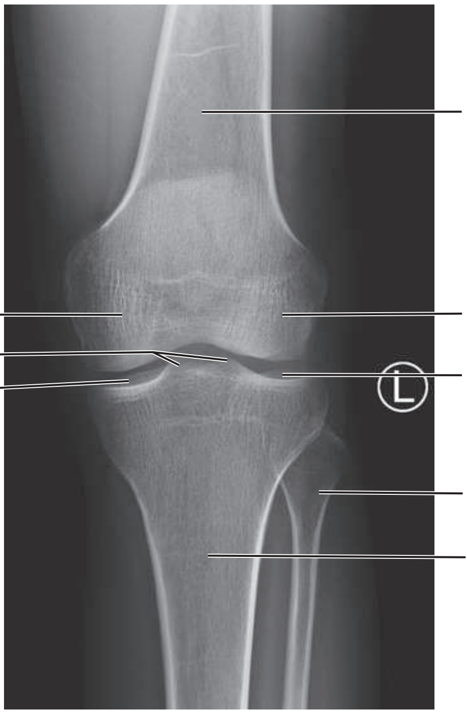
Right knee in flexion: anterior view

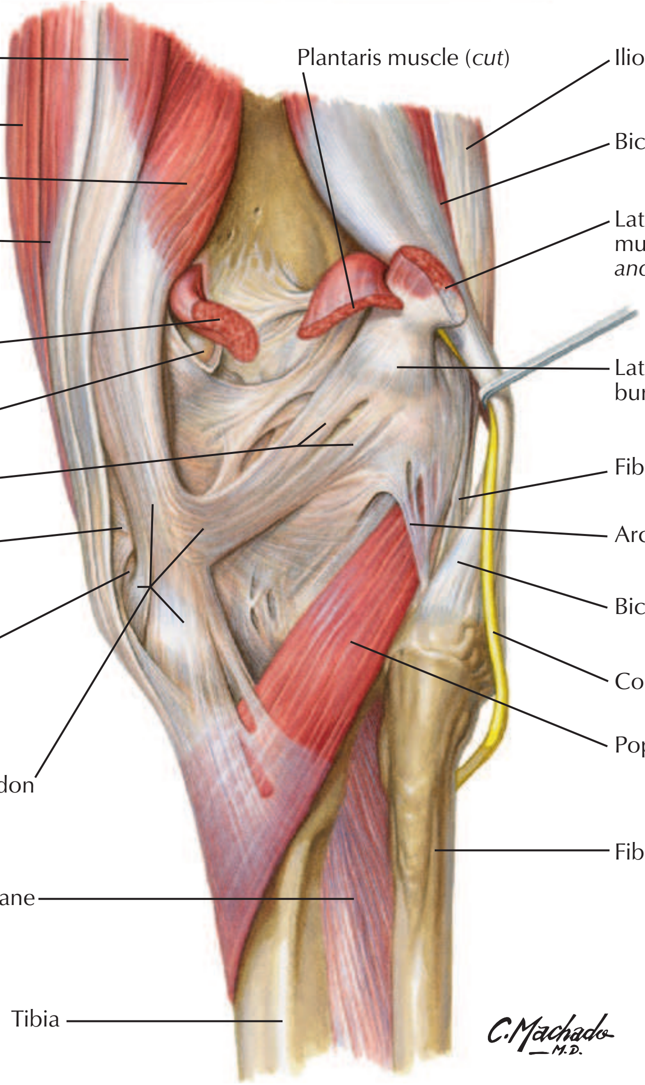

Anterior cruciate ligament
Lateral condyle of femur (articular surface)
Popliteus tendon
Fibular collateral ligament
Lateral meniscus
Transverse ligament of knee
Head of fibula
Tubercle of iliotibial tract (Gerdy's tubercle)
Posterior cruciate ligament
Medial condyle of femur (articular surface)
Medial meniscus
Tibial collateral ligament (superficial and deep fibers)
Medial condyle of tibia
Tibial tuberosity

Right knee in extension: posterior view


Adductor tubercle on medial condyle of femur
Medial condyle of femur (articular surface)
Tibial collateral ligament (superficial and deep fibers)
Medial meniscus
Medial condyle of tibia
Posterior cruciate ligament
Anterior cruciate ligament
Posterior meniscofemoral ligament
Lateral condyle of femur (articular surface)
Popliteus tendon
Fibular collateral ligament
Lateral meniscus
Head of fibula

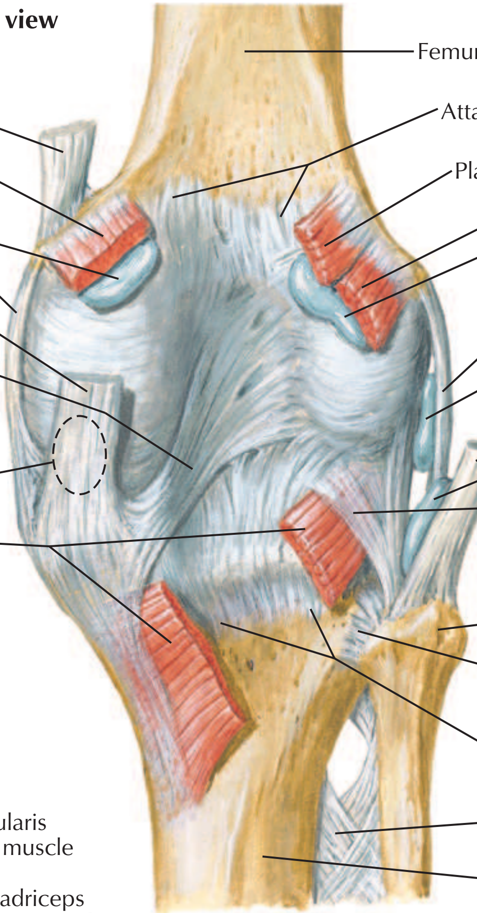
See also Plate 498

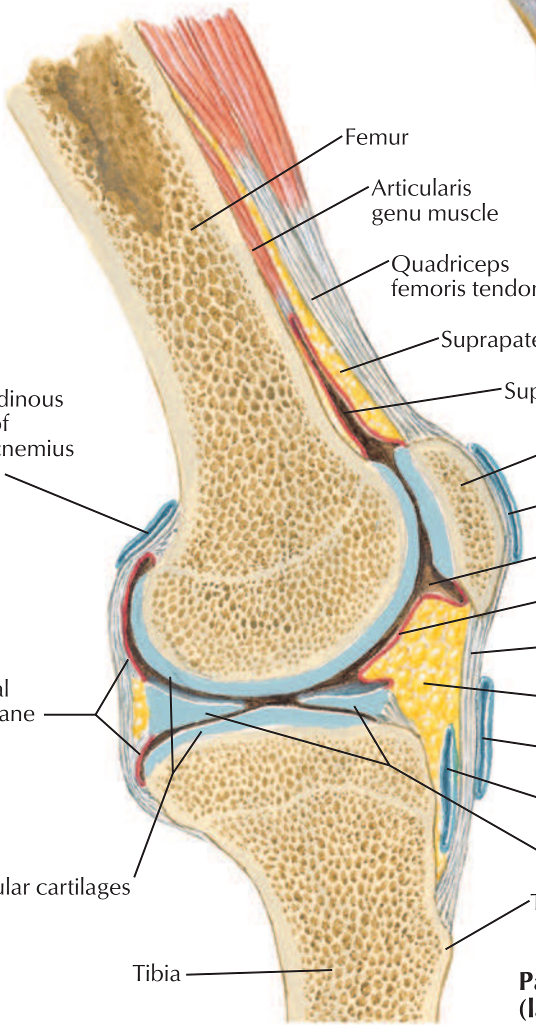

Femur
Medial femoral condyle
Lateral femoral condyle
Intercondylar eminence
Tibial plateau
Tibial plateau
L
Fibula
Tibia


Semitendinosus muscle
Plantaris muscle (*cut*)
Iliotibial tract
Sartorius muscle
Biceps femoris muscle
Semimembranosus muscle
Gracilis muscle
Lateral head of gastrocnemius muscle (*cut and reflected superiorly and laterally*)
Medial head of gastrocnemius muscle (*cut*)
Lateral subtendinous bursa of gastrocnemius muscle
Medial subtendinous bursa of gastrocnemius muscle (*open*)
Fibular collateral ligament
Oblique popliteal ligament
Arcuate popliteal ligament
Tibial collateral ligament
Biceps femoris tendon
Bursa of semimembranosus muscle
Common fibular nerve
Popliteus muscle
Semimembranosus tendon
Fibula
Interosseous membrane
Tibia
C.Machado M.D.

Knee: Posterior and Sagittal Views

Right knee: posterior view

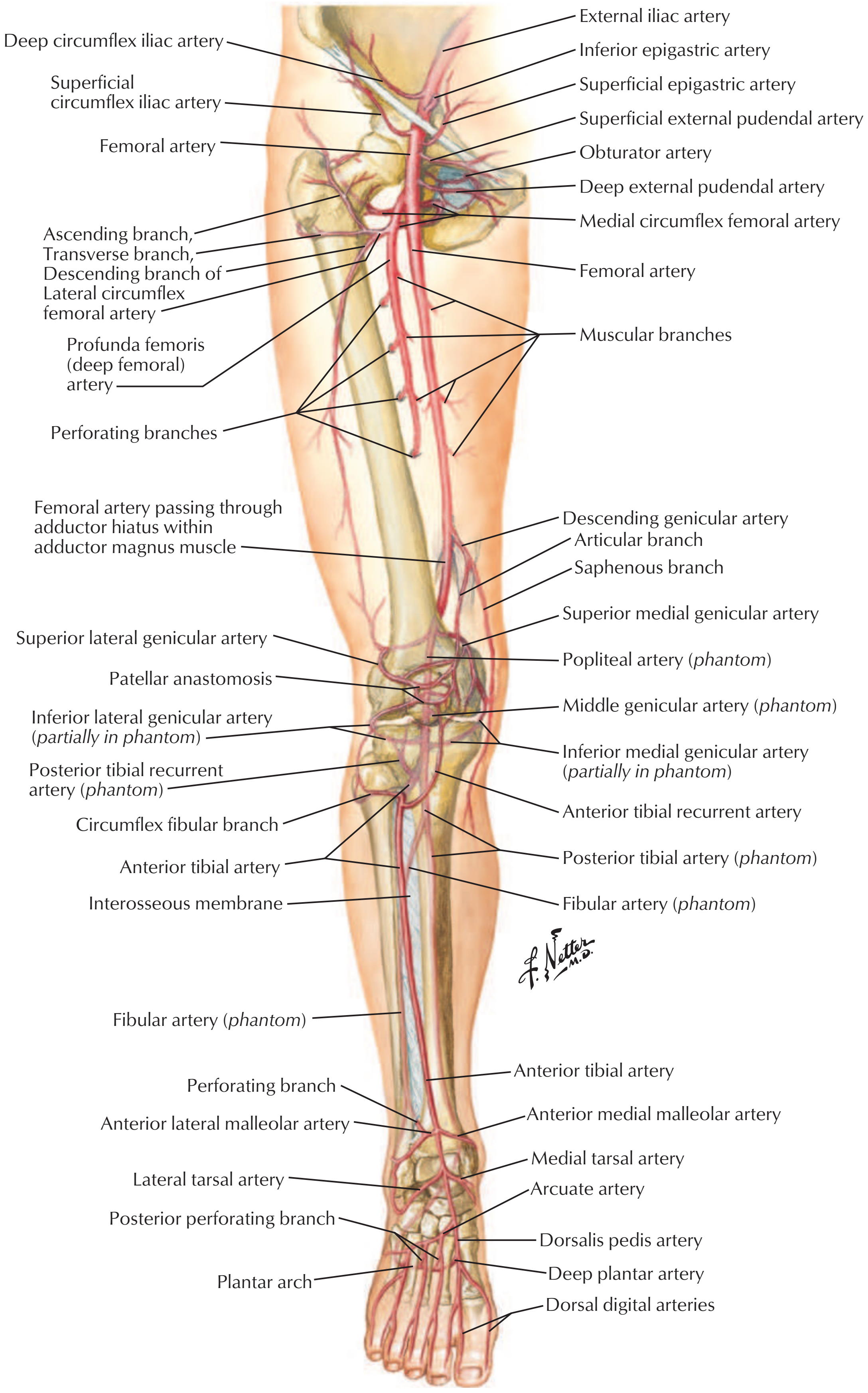

Femur (popliteal surface)
Adductor magnus tendon
Attachment of joint capsule
Medial head of gastrocnemius muscle and Subtendinous bursa
Plantaris muscle
Lateral head of gastrocnemius muscle and Subtendinous bursa
Tibial collateral ligament
Semimembranosus tendon
Fibular collateral ligament and its inferior Subtendinous bursa
Oblique popliteal ligament (tendinous expansion of semimembranosus muscle)
Biceps femoris tendon and Bursa beneath it
Semimembranosus bursa deep to tendon (*broken line*)
Arcuate popliteal ligament (edge of capsule that arches over popliteus muscle)
Popliteus muscle
Head of fibula
Posterior ligament of fibular head
Attachment of joint capsule
Interosseous membrane
Tibia

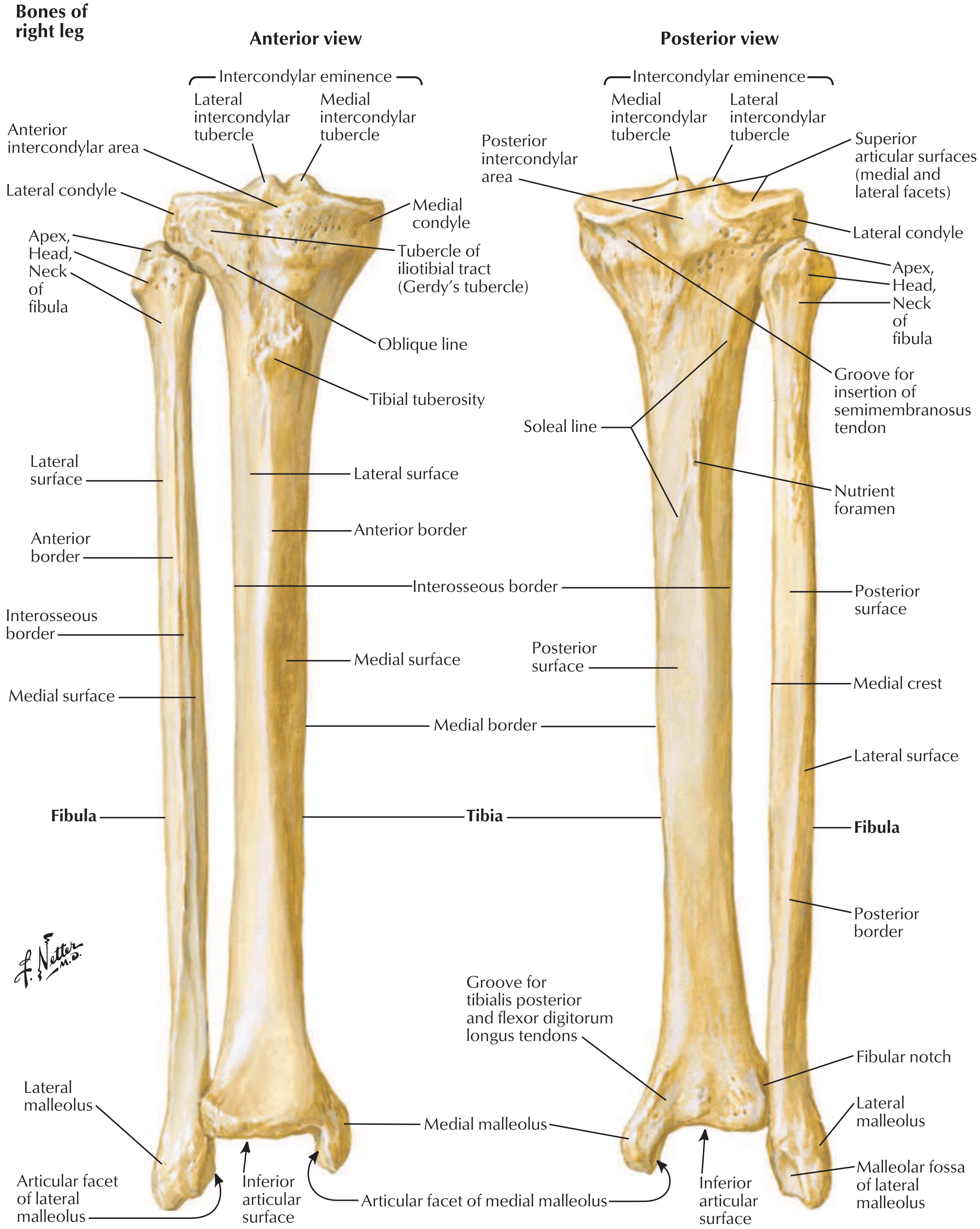

Femur
Articularis genu muscle
Quadriceps femoris tendon
Suprapatellar fat body
Lateral subtendinous bursa of gastrocnemius muscle
Suprapatellar (synovial) bursa
Patella
Subcutaneous prepatellar bursa
Articular cavity
Synovial membrane
Patellar ligament
Synovial membrane
Infrapatellar fat pad
Subcutaneous infrapatellar bursa
Deep (subtendinous) infrapatellar bursa
Lateral meniscus
Articular cartilages
Tibial tuberosity
Tibia

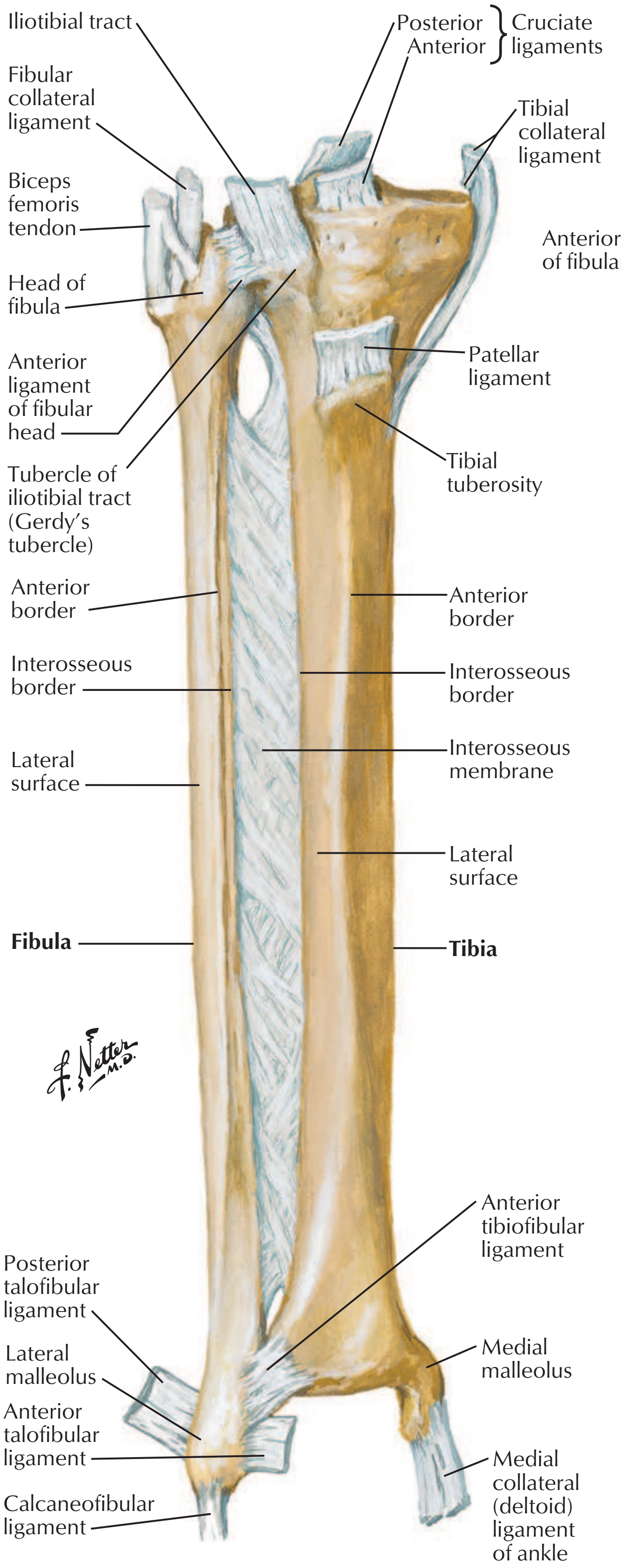
Parasagittal section (lateral to midline of knee)

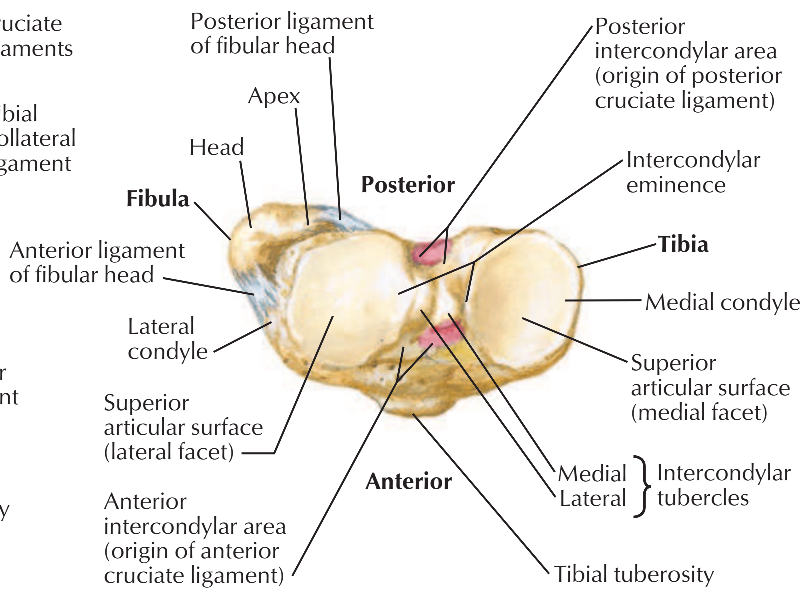
Arteries of Lower Limb: Schema

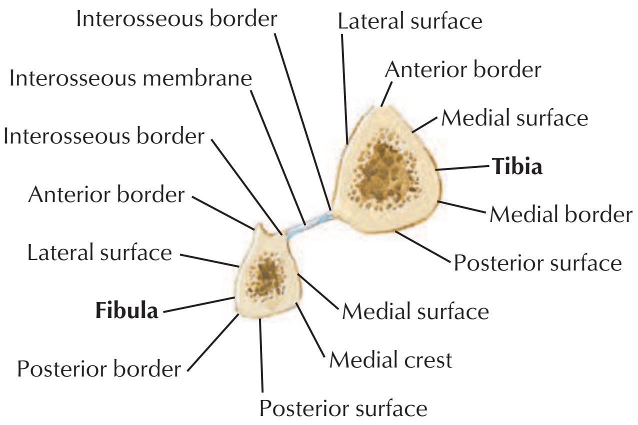
See also Plates 495, 512

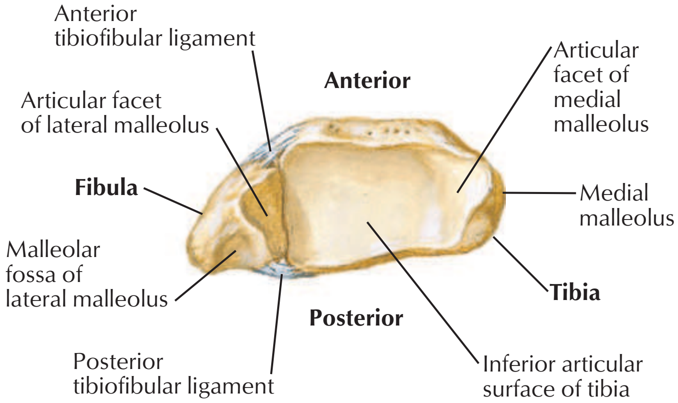

Deep circumflex iliac artery
Superficial circumflex iliac artery
Femoral artery
Ascending branch,
Transverse branch,
Descending branch of
Lateral circumflex femoral artery
Profunda femoris (deep femoral) artery
Perforating branches
Femoral artery passing through adductor hiatus within adductor magnus muscle
Superior lateral genicular artery
Patellar anastomosis
Inferior lateral genicular artery (*partially in phantom*)
Posterior tibial recurrent artery (*phantom*)
Circumflex fibular branch
Anterior tibial artery
Interosseous membrane
Fibular artery (*phantom*)
Perforating branch
Anterior lateral malleolar artery
Lateral tarsal artery
Posterior perforating branch
Plantar arch
External iliac artery
Inferior epigastric artery
Superficial epigastric artery
Superficial external pudendal artery
Obturator artery
Deep external pudendal artery
Medial circumflex femoral artery
Femoral artery
Muscular branches
Descending genicular artery
Articular branch
Saphenous branch
Superior medial genicular artery
Popliteal artery (*phantom*)
Middle genicular artery (*phantom*)
Inferior medial genicular artery (*partially in phantom*)
Anterior tibial recurrent artery
Posterior tibial artery (*phantom*)
Fibular artery (*phantom*)
F. Netter M.D.
Anterior tibial artery
Anterior medial malleolar artery
Medial tarsal artery
Arcuate artery
Dorsalis pedis artery
Deep plantar artery
Dorsal digital arteries


Bones of right leg
Anterior view
Posterior view
Intercondylar eminence
Lateral intercondylar tubercle
Medial intercondylar tubercle
Anterior intercondylar area
Lateral condyle
Medial condyle
Apex, Head, Neck of fibula
Tubercle of iliotibial tract (Gerdy's tubercle)
Oblique line
Tibial tuberosity
Lateral surface
Lateral surface
Anterior border
Anterior border
Interosseous border
Interosseous border
Medial surface
Medial surface
Medial border
Fibula
Tibia
Lateral malleolus
Articular facet of lateral malleolus
Inferior articular surface
Medial malleolus
Articular facet of medial malleolus
Intercondylar eminence
Medial intercondylar tubercle
Lateral intercondylar tubercle
Posterior intercondylar area
Superior articular surfaces (medial and lateral facets)
Lateral condyle
Apex, Head, Neck of fibula
Groove for insertion of semimembranosus tendon
Soleal line
Nutrient foramen
Posterior surface
Posterior surface
Medial crest
Lateral surface
Fibula
Posterior border
Groove for tibialis posterior and flexor digitorum longus tendons
Fibular notch
Lateral malleolus
Malleolar fossa of lateral malleolus
Inferior articular surface
F. Netter M.D.


Anterior view with ligament attachments
Iliotibial tract
Posterior
Anterior
Cruciate ligaments
Fibular collateral ligament
Tibial collateral ligament
Biceps femoris tendon
Head of fibula
Anterior ligament of fibular head
Patellar ligament
Tubercle of iliotibial tract (Gerdy's tubercle)
Tibial tuberosity
Anterior border
Anterior border
Interosseous border
Interosseous border
Lateral surface
Interosseous membrane
Lateral surface
Fibula
Tibia
Anterior tibiofibular ligament
Posterior talofibular ligament
Lateral malleolus
Medial malleolus
Anterior talofibular ligament
Medial collateral (deltoid) ligament of ankle
Calcaneofibular ligament

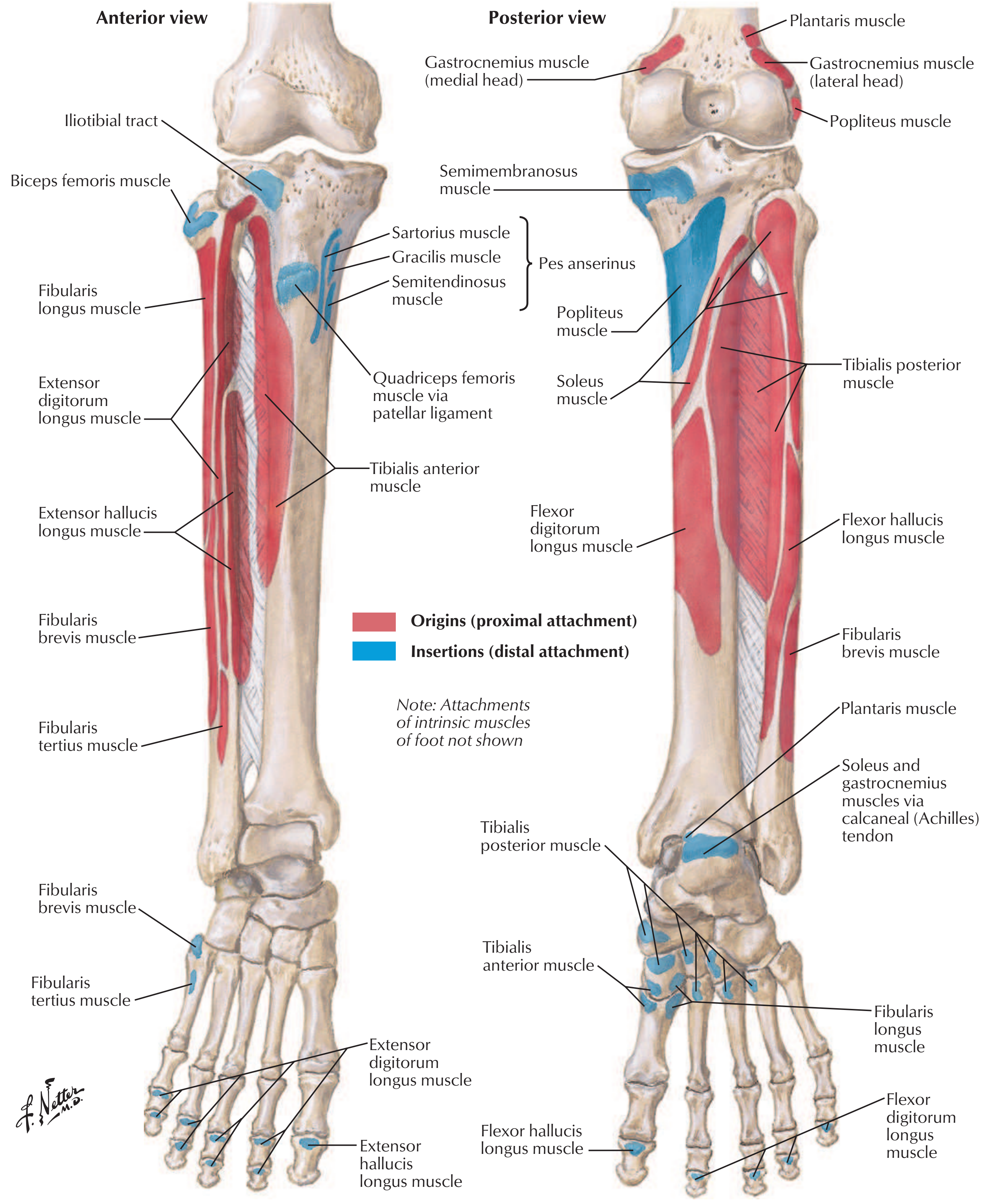

Superior view
Posterior ligament of fibular head
Posterior intercondylar area (origin of posterior cruciate ligament)
Apex
Head
Posterior
Intercondylar eminence
Fibula
Tibia
Anterior ligament of fibular head
Medial condyle
Lateral condyle
Superior articular surface (medial facet)
Superior articular surface (lateral facet)
Anterior
Medial
Lateral
Intercondylar tubercles
Anterior intercondylar area (origin of anterior cruciate ligament)
Tibial tuberosity


Cross section
Interosseous border
Lateral surface
Interosseous membrane
Anterior border
Medial surface
Interosseous border
Tibia
Anterior border
Medial border
Lateral surface
Posterior surface
Fibula
Medial surface
Posterior border
Medial crest
Posterior surface


Inferior view
Anterior tibiofibular ligament
Anterior
Articular facet of medial malleolus
Articular facet of lateral malleolus
Fibula
Medial malleolus
Malleolar fossa of lateral malleolus
Tibia
Posterior
Posterior tibiofibular ligament
Inferior articular surface of tibia

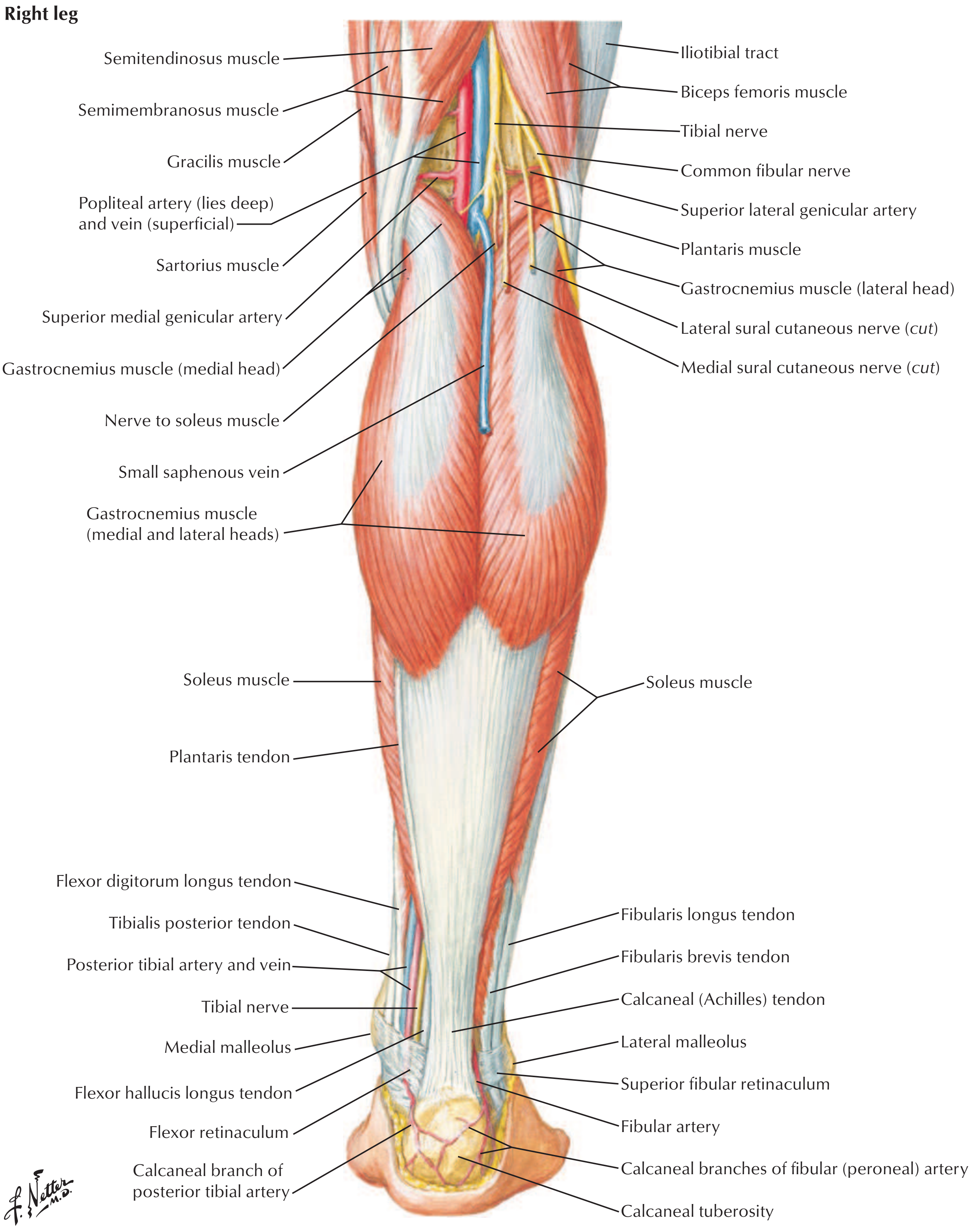
Attachments of Muscles of Leg

See also **Plates 509, 512**



Anterior view
Posterior view
Iliotibial tract
Biceps femoris muscle
Fibularis longus muscle
Extensor digitorum longus muscle
Extensor hallucis longus muscle
Fibularis brevis muscle
Fibularis tertius muscle
Sartorius muscle
Gracilis muscle
Semitendinosus muscle
Pes anserinus
Quadriceps femoris muscle via patellar ligament
Tibialis anterior muscle
Fibularis brevis muscle
Fibularis tertius muscle
Extensor digitorum longus muscle
Extensor hallucis longus muscle
Gastrocnemius muscle (medial head)
Plantaris muscle
Gastrocnemius muscle (lateral head)
Popliteus muscle
Semimembranosus muscle
Popliteus muscle
Soleus muscle
Tibialis posterior muscle
Flexor digitorum longus muscle
Flexor hallucis longus muscle
Fibularis brevis muscle
Plantaris muscle
Soleus and gastrocnemius muscles via calcaneal (Achilles) tendon
Tibialis posterior muscle
Tibialis anterior muscle
Fibularis longus muscle
Flexor digitorum longus muscle
Flexor hallucis longus muscle
🟥 Origins (proximal attachment)
🟦 Insertions (distal attachment)
Note: Attachments of intrinsic muscles of foot not shown
F. Netter M.D.

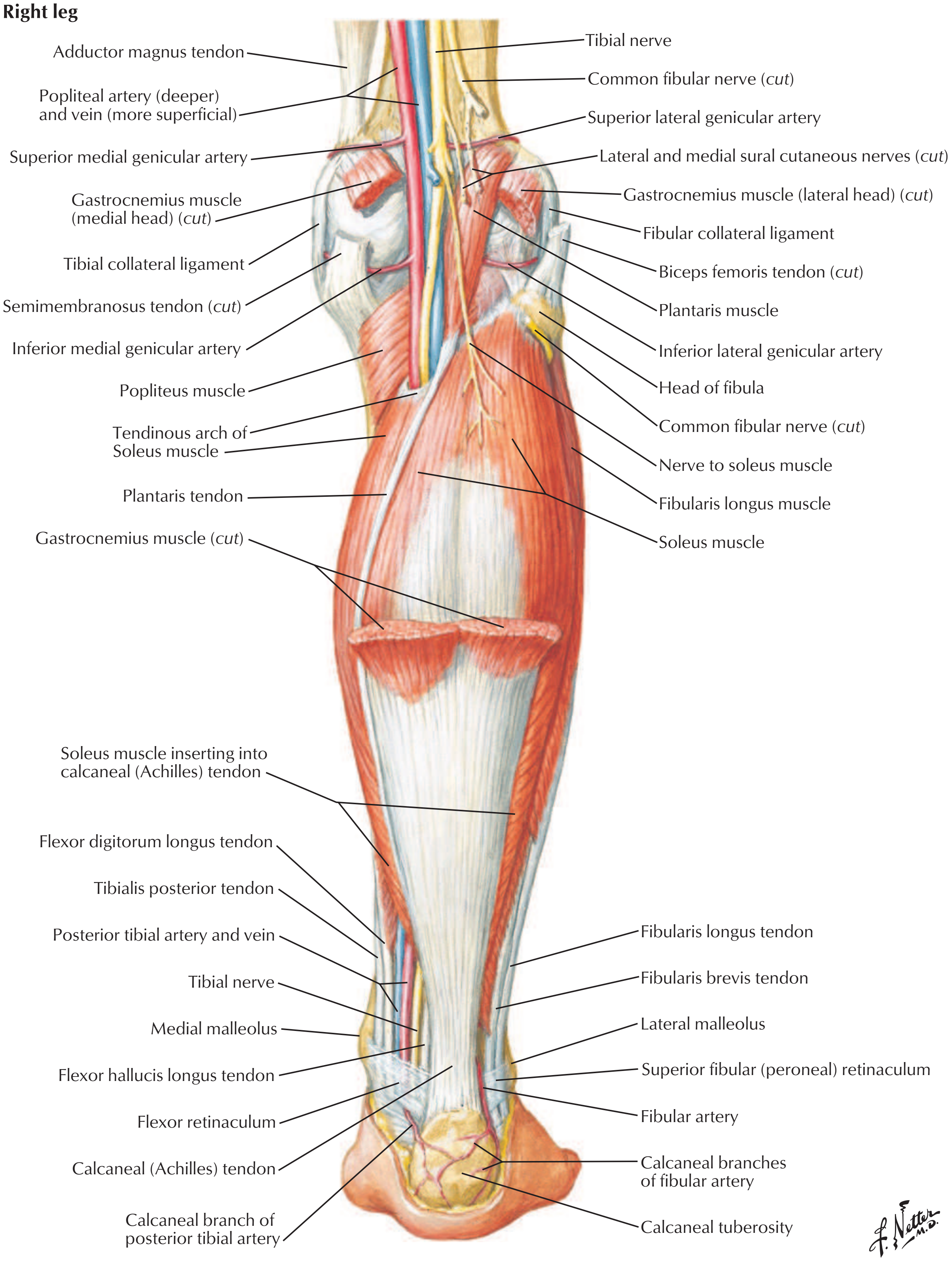
See also Plate 532


Right leg
Semitendinosus muscle
Semimembranosus muscle
Gracilis muscle
Popliteal artery (lies deep) and vein (superficial)
Sartorius muscle
Superior medial genicular artery
Gastrocnemius muscle (medial head)
Nerve to soleus muscle
Small saphenous vein
Gastrocnemius muscle (medial and lateral heads)
Soleus muscle
Plantaris tendon
Flexor digitorum longus tendon
Tibialis posterior tendon
Posterior tibial artery and vein
Tibial nerve
Medial malleolus
Flexor hallucis longus tendon
Flexor retinaculum
Calcaneal branch of posterior tibial artery
Iliotibial tract
Biceps femoris muscle
Tibial nerve
Common fibular nerve
Superior lateral genicular artery
Plantaris muscle
Gastrocnemius muscle (lateral head)
Lateral sural cutaneous nerve (*cut*)
Medial sural cutaneous nerve (*cut*)
Soleus muscle
Fibularis longus tendon
Fibularis brevis tendon
Calcaneal (Achilles) tendon
Lateral malleolus
Superior fibular retinaculum
Fibular artery
Calcaneal branches of fibular (peroneal) artery
Calcaneal tuberosity
F. Netter M.D.

Muscles of Leg (Intermediate Dissection): Posterior View

See also **Plate 532**

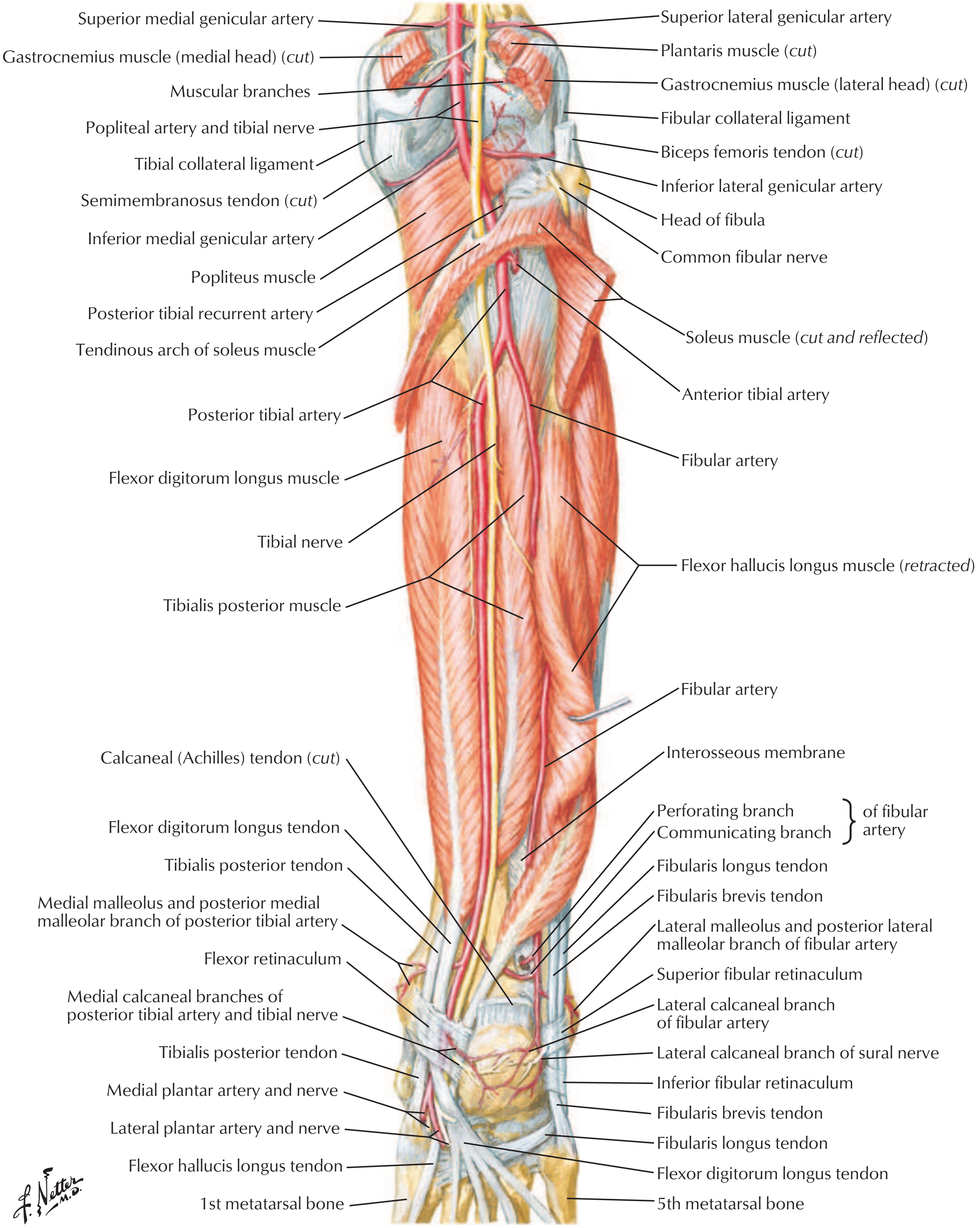
Right leg



Adductor magnus tendon
Popliteal artery (deeper) and vein (more superficial)
Superior medial genicular artery
Gastrocnemius muscle (medial head) (*cut*)
Tibial collateral ligament
Semimembranosus tendon (*cut*)
Inferior medial genicular artery
Popliteus muscle
Tendinous arch of Soleus muscle
Plantaris tendon
Gastrocnemius muscle (*cut*)
Soleus muscle inserting into calcaneal (Achilles) tendon
Flexor digitorum longus tendon
Tibialis posterior tendon
Posterior tibial artery and vein
Tibial nerve
Medial malleolus
Flexor hallucis longus tendon
Flexor retinaculum
Calcaneal (Achilles) tendon
Calcaneal branch of posterior tibial artery
Tibial nerve
Common fibular nerve (*cut*)
Superior lateral genicular artery
Lateral and medial sural cutaneous nerves (*cut*)
Gastrocnemius muscle (lateral head) (*cut*)
Fibular collateral ligament
Biceps femoris tendon (*cut*)
Plantaris muscle
Inferior lateral genicular artery
Head of fibula
Common fibular nerve (*cut*)
Nerve to soleus muscle
Fibularis longus muscle
Soleus muscle
Fibularis longus tendon
Fibularis brevis tendon
Lateral malleolus
Superior fibular (peroneal) retinaculum
Fibular artery
Calcaneal branches of fibular artery
Calcaneal tuberosity
F. Netter M.D.

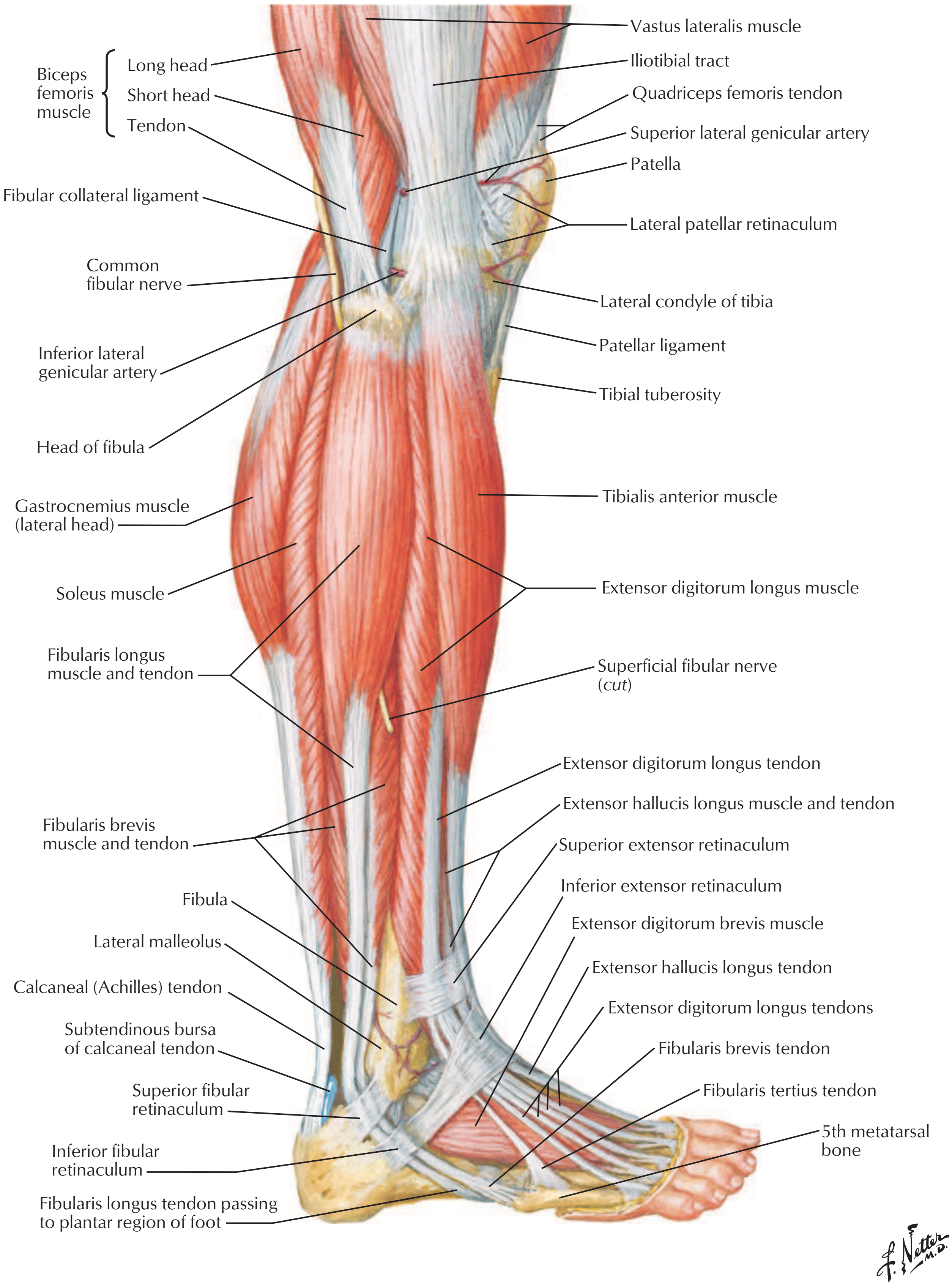
See also Plate 532

Right leg


Superior medial genicular artery
Gastrocnemius muscle (medial head) (*cut*)
Muscular branches
Popliteal artery and tibial nerve
Tibial collateral ligament
Semimembranosus tendon (*cut*)
Inferior medial genicular artery
Popliteus muscle
Posterior tibial recurrent artery
Tendinous arch of soleus muscle
Posterior tibial artery
Flexor digitorum longus muscle
Tibial nerve
Tibialis posterior muscle
Calcaneal (Achilles) tendon (*cut*)
Flexor digitorum longus tendon
Tibialis posterior tendon
Medial malleolus and posterior medial malleolar branch of posterior tibial artery
Flexor retinaculum
Medial calcaneal branches of posterior tibial artery and tibial nerve
Tibialis posterior tendon
Medial plantar artery and nerve
Lateral plantar artery and nerve
Flexor hallucis longus tendon
1st metatarsal bone
Superior lateral genicular artery
Plantaris muscle (*cut*)
Gastrocnemius muscle (lateral head) (*cut*)
Fibular collateral ligament
Biceps femoris tendon (*cut*)
Inferior lateral genicular artery
Head of fibula
Common fibular nerve
Soleus muscle (*cut and reflected*)
Anterior tibial artery
Fibular artery
Flexor hallucis longus muscle (*retracted*)
Fibular artery
Interosseous membrane
Perforating branch
Communicating branch
of fibular artery
Fibularis longus tendon
Fibularis brevis tendon
Lateral malleolus and posterior lateral malleolar branch of fibular artery
Superior fibular retinaculum
Lateral calcaneal branch of fibular artery
Lateral calcaneal branch of sural nerve
Inferior fibular retinaculum
Fibularis brevis tendon
Fibularis longus tendon
Flexor digitorum longus tendon
5th metatarsal bone
F. Netter M.D.

Muscles of Leg: Lateral View

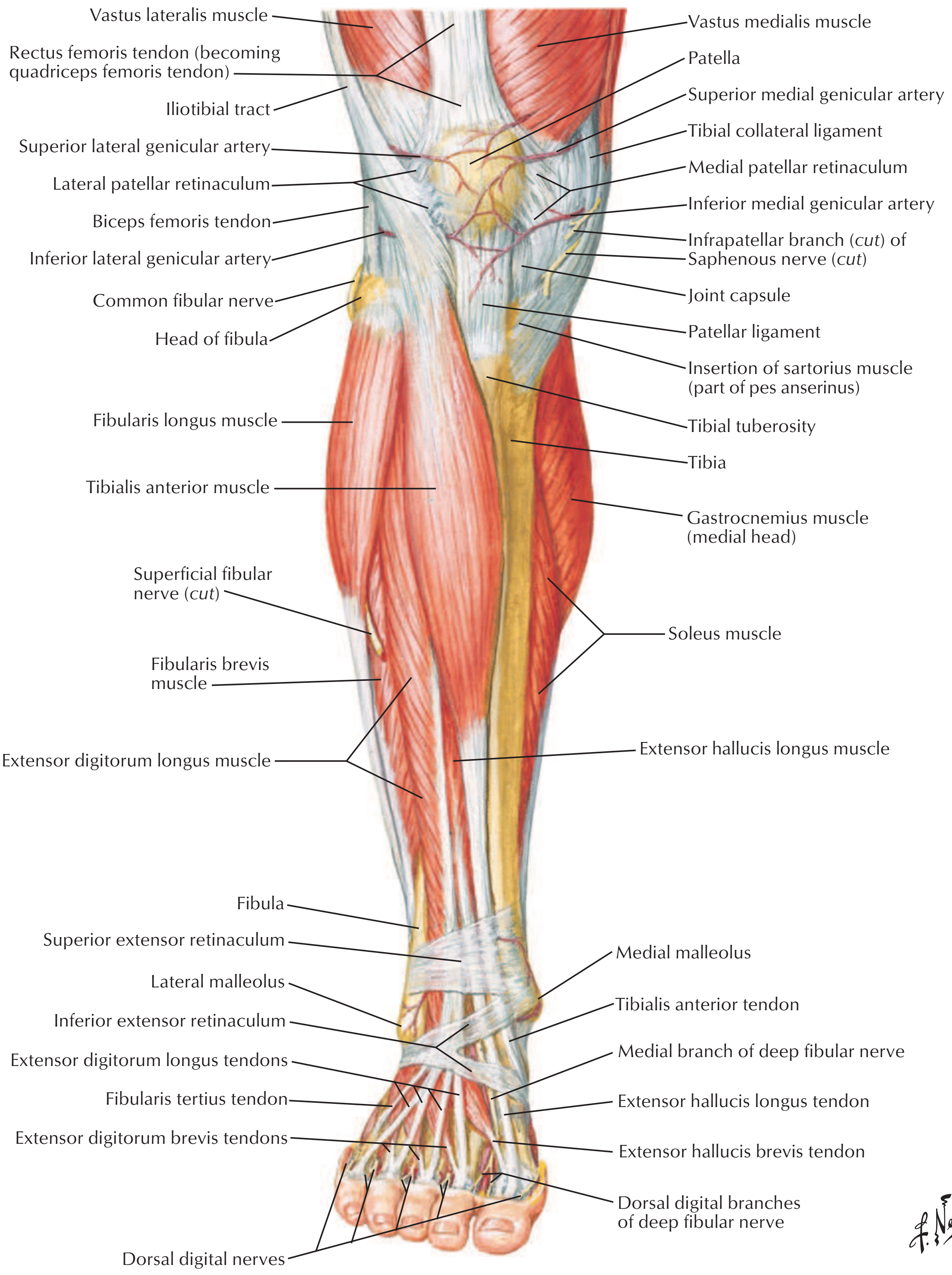
See also Plates 520, 533



Biceps femoris muscle
Long head
Short head
Tendon
Fibular collateral ligament
Common fibular nerve
Inferior lateral genicular artery
Head of fibula
Gastrocnemius muscle (lateral head)
Soleus muscle
Fibularis longus muscle and tendon
Fibularis brevis muscle and tendon
Fibula
Lateral malleolus
Calcaneal (Achilles) tendon
Subtendinous bursa of calcaneal tendon
Superior fibular retinaculum
Inferior fibular retinaculum
Fibularis longus tendon passing to plantar region of foot
Vastus lateralis muscle
Iliotibial tract
Quadriceps femoris tendon
Superior lateral genicular artery
Patella
Lateral patellar retinaculum
Lateral condyle of tibia
Patellar ligament
Tibial tuberosity
Tibialis anterior muscle
Extensor digitorum longus muscle
Superficial fibular nerve (*cut*)
Extensor digitorum longus tendon
Extensor hallucis longus muscle and tendon
Superior extensor retinaculum
Inferior extensor retinaculum
Extensor digitorum brevis muscle
Extensor hallucis longus tendon
Extensor digitorum longus tendons
Fibularis brevis tendon
Fibularis tertius tendon
5th metatarsal bone

Muscles of Leg (Superficial Dissection): Anterior View

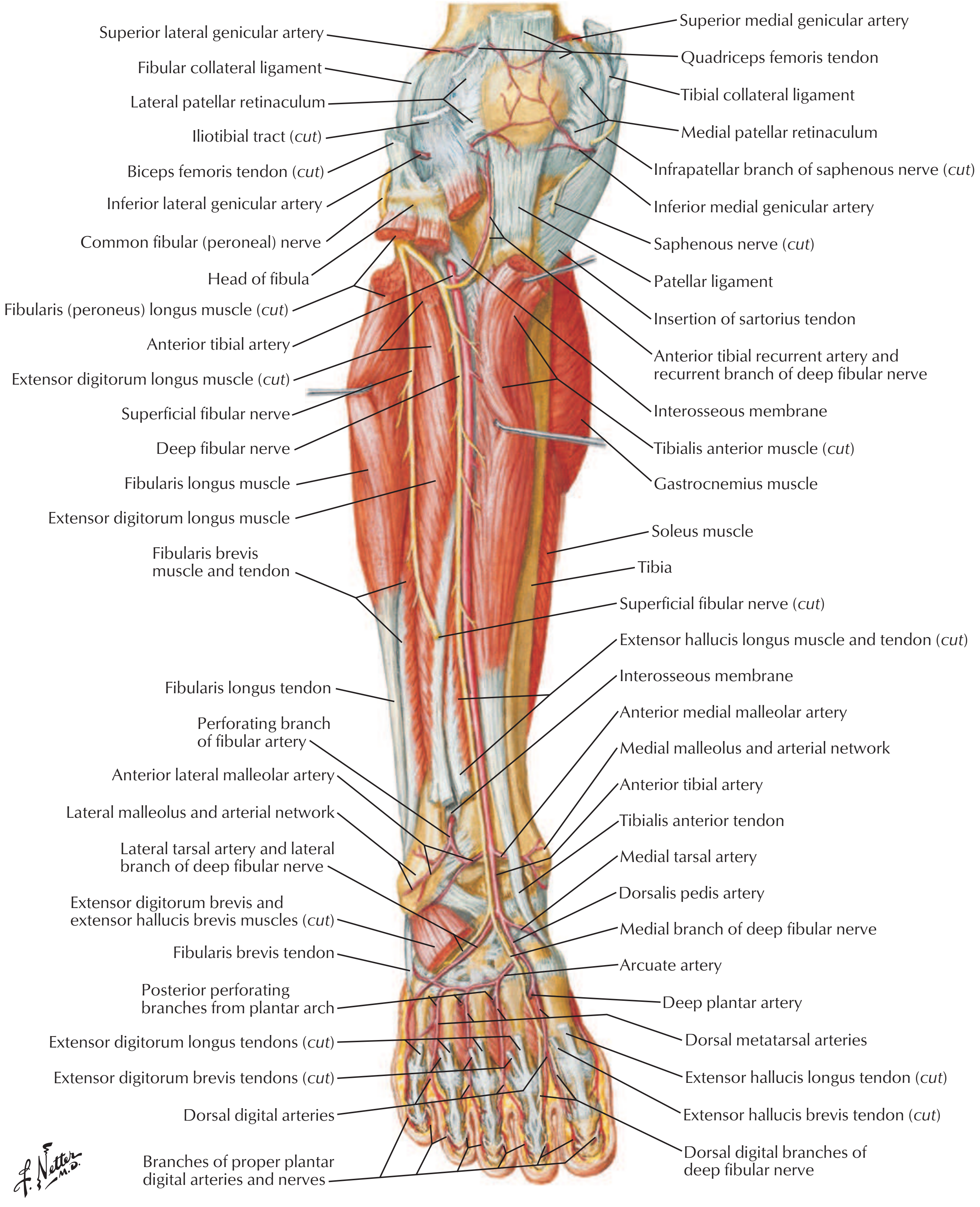
See also Plate 533

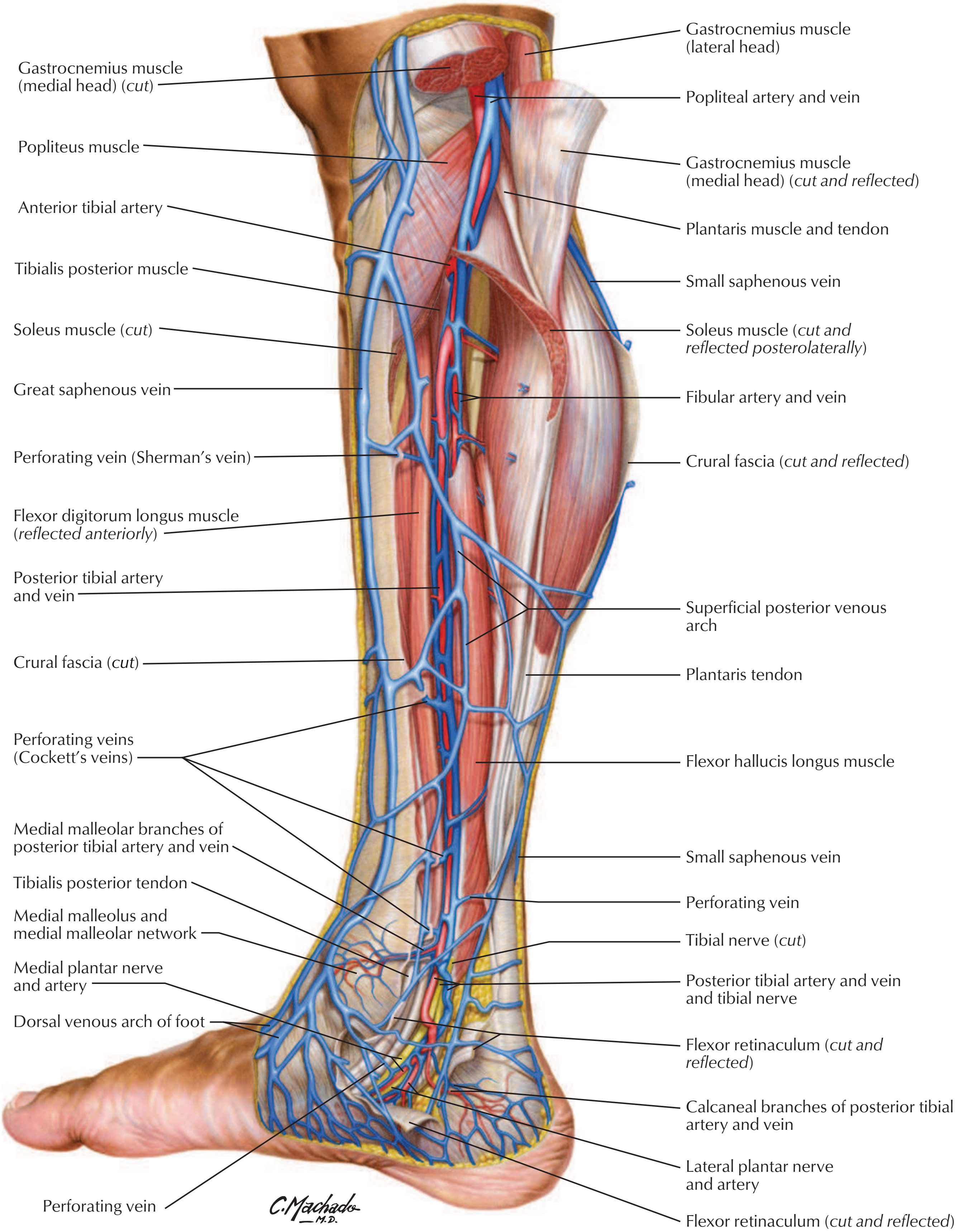

Vastus lateralis muscle
Rectus femoris tendon (becoming quadriceps femoris tendon)
Iliotibial tract
Superior lateral genicular artery
Lateral patellar retinaculum
Biceps femoris tendon
Inferior lateral genicular artery
Common fibular nerve
Head of fibula
Fibularis longus muscle
Tibialis anterior muscle
Superficial fibular nerve (*cut*)
Fibularis brevis muscle
Extensor digitorum longus muscle
Fibula
Superior extensor retinaculum
Lateral malleolus
Inferior extensor retinaculum
Extensor digitorum longus tendons
Fibularis tertius tendon
Extensor digitorum brevis tendons
Dorsal digital nerves
Vastus medialis muscle
Patella
Superior medial genicular artery
Tibial collateral ligament
Medial patellar retinaculum
Inferior medial genicular artery
Infrapatellar branch (*cut*) of Saphenous nerve (*cut*)
Joint capsule
Patellar ligament
Insertion of sartorius muscle (part of pes anserinus)
Tibial tuberosity
Tibia
Gastrocnemius muscle (medial head)
Soleus muscle
Extensor hallucis longus muscle
Medial malleolus
Tibialis anterior tendon
Medial branch of deep fibular nerve
Extensor hallucis longus tendon
Extensor hallucis brevis tendon
Dorsal digital branches of deep fibular nerve

F. Netter M.D.

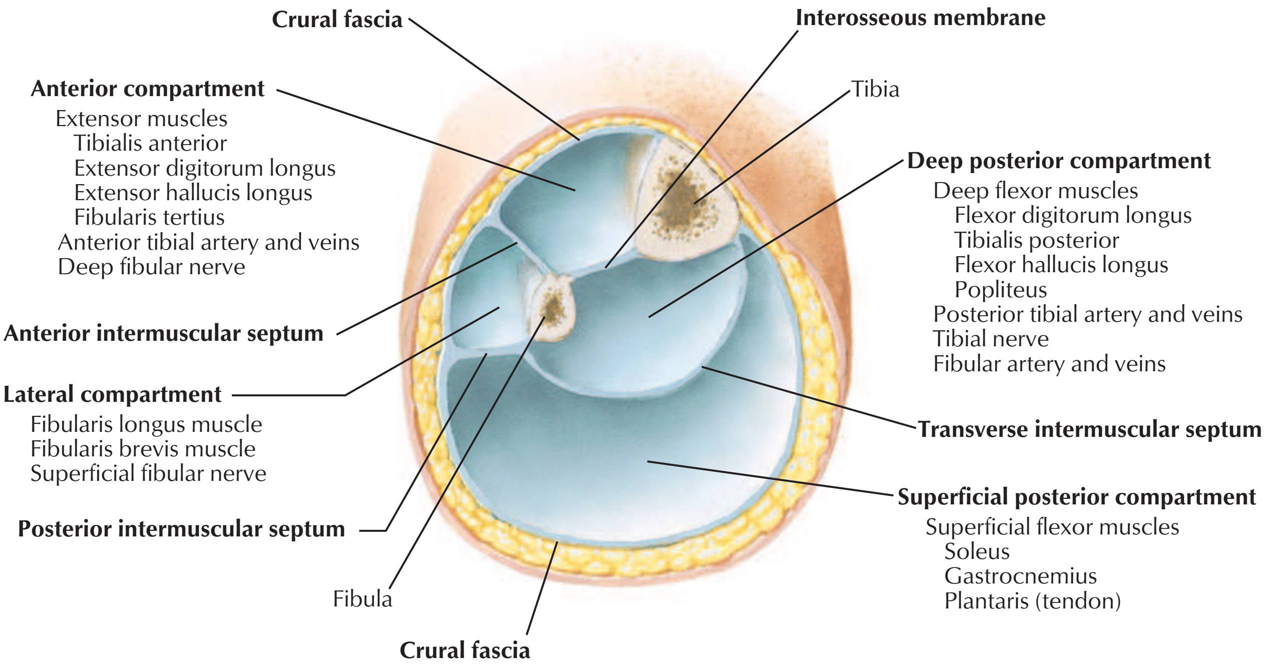
Muscles of Leg (Deep Dissection): Anterior View

See also Plates 521, 533

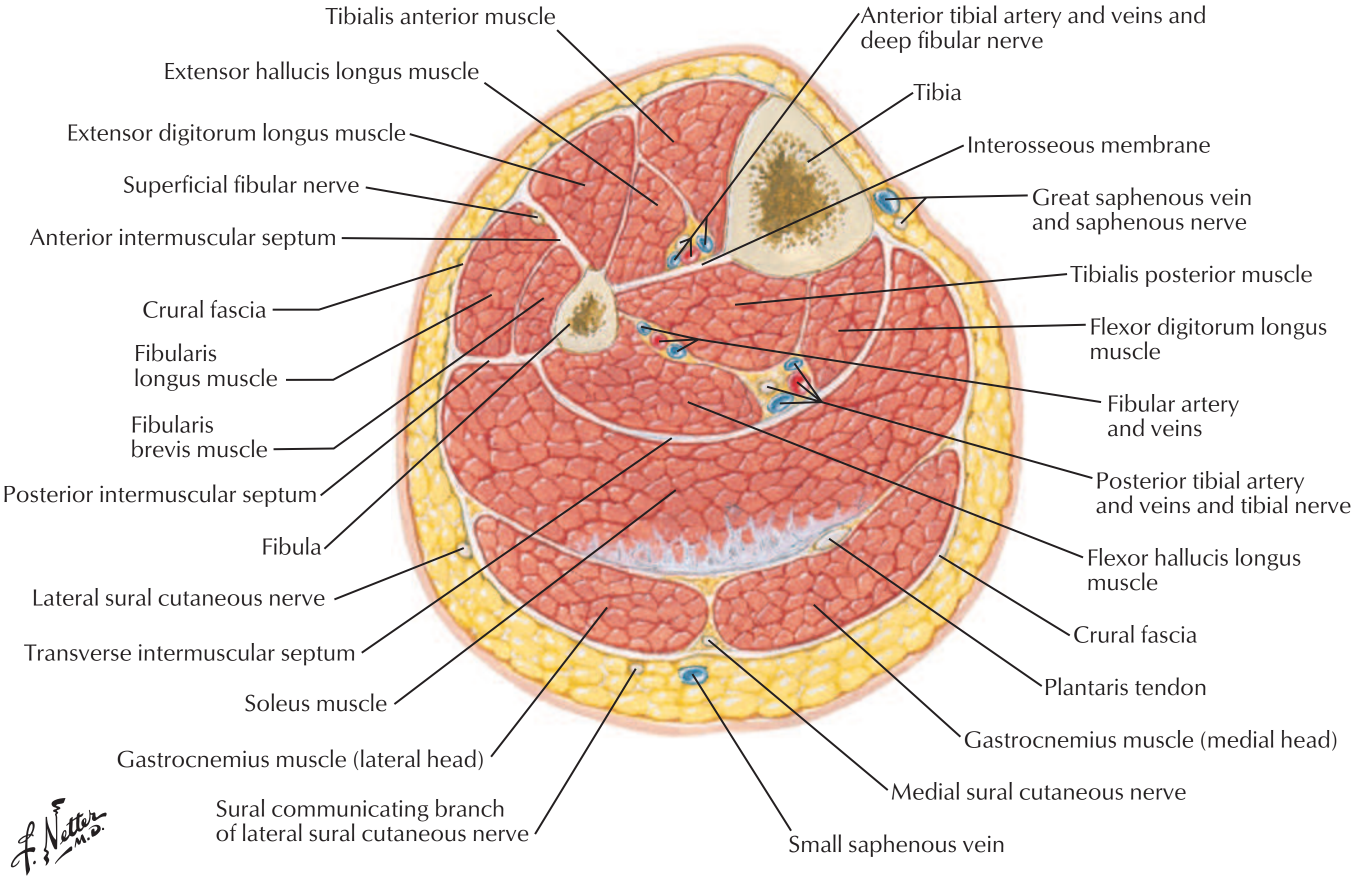

Superior lateral genicular artery
Fibular collateral ligament
Lateral patellar retinaculum
Iliotibial tract (*cut*)
Biceps femoris tendon (*cut*)
Inferior lateral genicular artery
Common fibular (peroneal) nerve
Head of fibula
Fibularis (peroneus) longus muscle (*cut*)
Anterior tibial artery
Extensor digitorum longus muscle (*cut*)
Superficial fibular nerve
Deep fibular nerve
Fibularis longus muscle
Extensor digitorum longus muscle
Fibularis brevis muscle and tendon
Fibularis longus tendon
Perforating branch of fibular artery
Anterior lateral malleolar artery
Lateral malleolus and arterial network
Lateral tarsal artery and lateral branch of deep fibular nerve
Extensor digitorum brevis and extensor hallucis brevis muscles (*cut*)
Fibularis brevis tendon
Posterior perforating branches from plantar arch
Extensor digitorum longus tendons (*cut*)
Extensor digitorum brevis tendons (*cut*)
Dorsal digital arteries
Branches of proper plantar digital arteries and nerves
Superior medial genicular artery
Quadriceps femoris tendon
Tibial collateral ligament
Medial patellar retinaculum
Infrapatellar branch of saphenous nerve (*cut*)
Inferior medial genicular artery
Saphenous nerve (*cut*)
Patellar ligament
Insertion of sartorius tendon
Anterior tibial recurrent artery and recurrent branch of deep fibular nerve
Interosseous membrane
Tibialis anterior muscle (*cut*)
Gastrocnemius muscle
Soleus muscle
Tibia
Superficial fibular nerve (*cut*)
Extensor hallucis longus muscle and tendon (*cut*)
Interosseous membrane
Anterior medial malleolar artery
Medial malleolus and arterial network
Anterior tibial artery
Tibialis anterior tendon
Medial tarsal artery
Dorsalis pedis artery
Medial branch of deep fibular nerve
Arcuate artery
Deep plantar artery
Dorsal metatarsal arteries
Extensor hallucis longus tendon (*cut*)
Extensor hallucis brevis tendon (*cut*)
Dorsal digital branches of deep fibular nerve
f. Netter M.D.

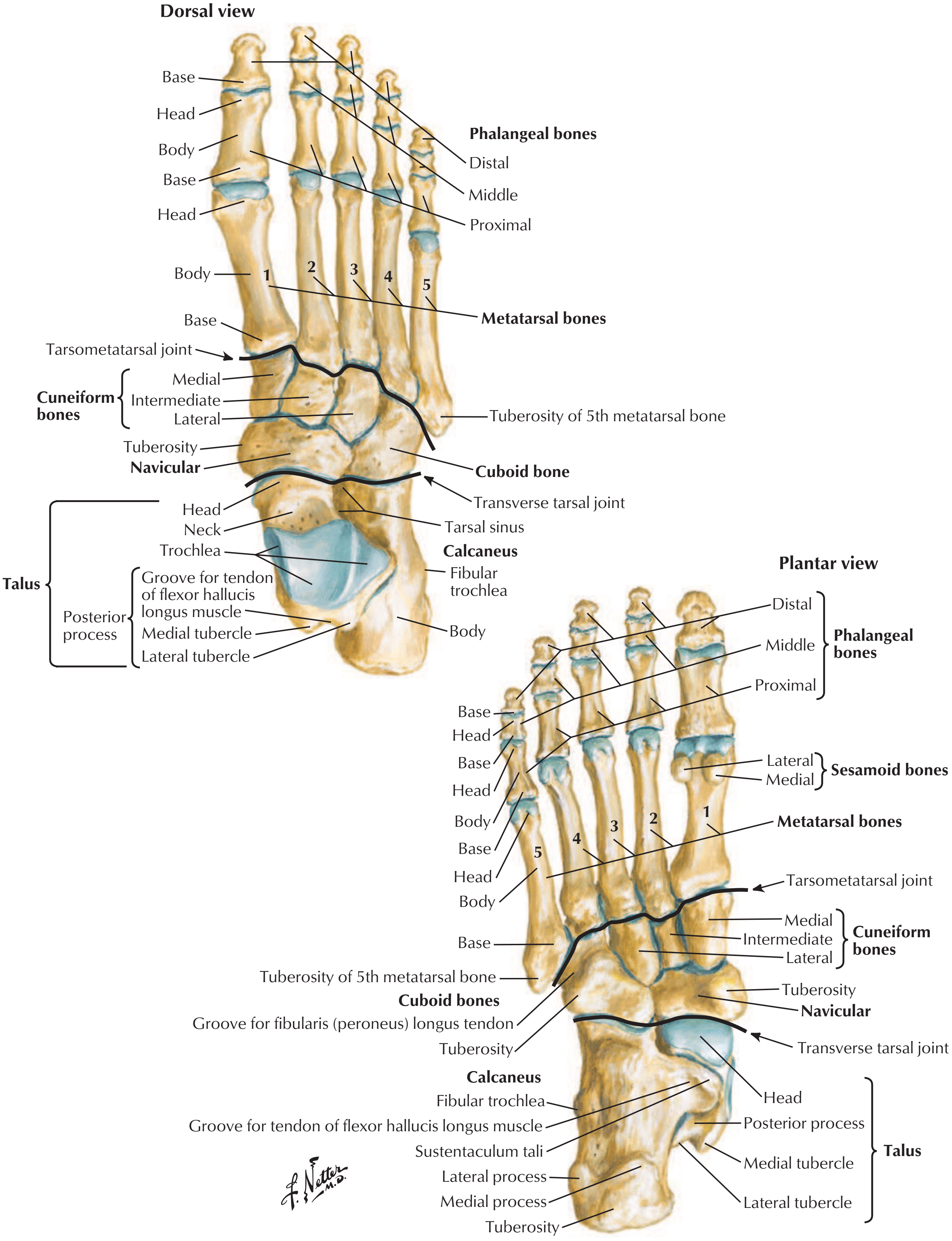

Gastrocnemius muscle (medial head) (*cut*)
Popliteus muscle
Anterior tibial artery
Tibialis posterior muscle
Soleus muscle (*cut*)
Great saphenous vein
Perforating vein (Sherman's vein)
Flexor digitorum longus muscle (*reflected anteriorly*)
Posterior tibial artery and vein
Crural fascia (*cut*)
Perforating veins (Cockett's veins)
Medial malleolar branches of posterior tibial artery and vein
Tibialis posterior tendon
Medial malleolus and medial malleolar network
Medial plantar nerve and artery
Dorsal venous arch of foot
Perforating vein
Gastrocnemius muscle (lateral head)
Popliteal artery and vein
Gastrocnemius muscle (medial head) (*cut and reflected*)
Plantaris muscle and tendon
Small saphenous vein
Soleus muscle (*cut and reflected posterolaterally*)
Fibular artery and vein
Crural fascia (*cut and reflected*)
Superficial posterior venous arch
Plantaris tendon
Flexor hallucis longus muscle
Small saphenous vein
Perforating vein
Tibial nerve (*cut*)
Posterior tibial artery and vein and tibial nerve
Flexor retinaculum (*cut and reflected*)
Calcaneal branches of posterior tibial artery and vein
Lateral plantar nerve and artery
Flexor retinaculum (*cut and reflected*)
C.Machado M.D.

Leg: Cross Sections and Fascial Compartments


Crural fascia
Anterior compartment
Extensor muscles
Tibialis anterior
Extensor digitorum longus
Extensor hallucis longus
Fibularis tertius
Anterior tibial artery and veins
Deep fibular nerve
Anterior intermuscular septum
Lateral compartment
Fibularis longus muscle
Fibularis brevis muscle
Superficial fibular nerve
Posterior intermuscular septum
Fibula
Crural fascia
Interosseous membrane
Tibia
Deep posterior compartment
Deep flexor muscles
Flexor digitorum longus
Tibialis posterior
Flexor hallucis longus
Popliteus
Posterior tibial artery and veins
Tibial nerve
Fibular artery and veins
Transverse intermuscular septum
Superficial posterior compartment
Superficial flexor muscles
Soleus
Gastrocnemius
Plantaris (tendon)

Cross section just above middle of leg


Tibialis anterior muscle
Extensor hallucis longus muscle
Extensor digitorum longus muscle
Superficial fibular nerve
Anterior intermuscular septum
Crural fascia
Fibularis longus muscle
Fibularis brevis muscle
Posterior intermuscular septum
Fibula
Lateral sural cutaneous nerve
Transverse intermuscular septum
Soleus muscle
Gastrocnemius muscle (lateral head)
Sural communicating branch of lateral sural cutaneous nerve
Anterior tibial artery and veins and deep fibular nerve
Tibia
Interosseous membrane
Great saphenous vein and saphenous nerve
Tibialis posterior muscle
Flexor digitorum longus muscle
Fibular artery and veins
Posterior tibial artery and veins and tibial nerve
Flexor hallucis longus muscle
Crural fascia
Plantaris tendon
Gastrocnemius muscle (medial head)
Medial sural cutaneous nerve
Small saphenous vein


Dorsal view

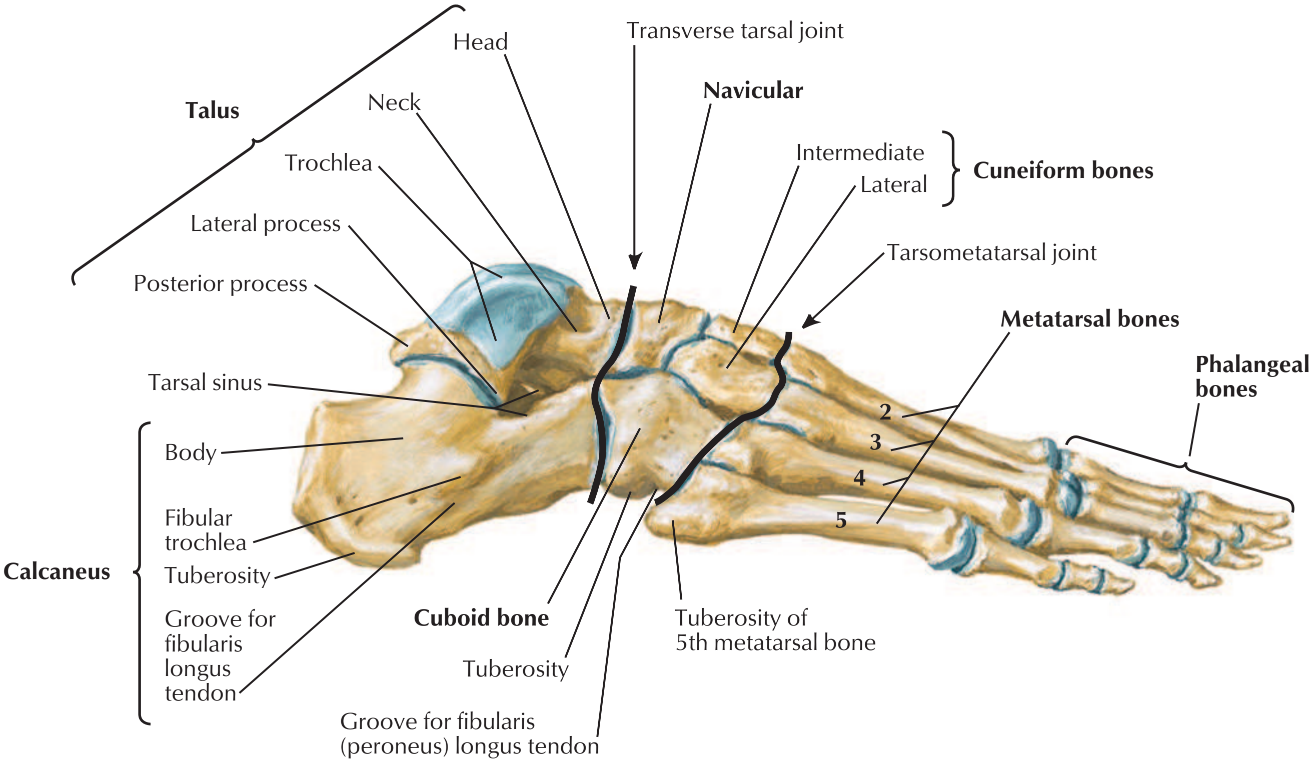
Base
Head
Body
Base
Head
Phalangeal bones
Distal
Middle
Proximal
Body
1
2
3
4
5
Metatarsal bones
Base
Tarsometatarsal joint
Cuneiform bones
Medial
Intermediate
Lateral
Tuberosity of 5th metatarsal bone
Tuberosity
Navicular
Cuboid bone
Transverse tarsal joint
Talus
Head
Neck
Trochlea
Tarsal sinus
Calcaneus
Fibular trochlea
Posterior process
Groove for tendon of flexor hallucis longus muscle
Medial tubercle
Lateral tubercle
Body

Plantar view

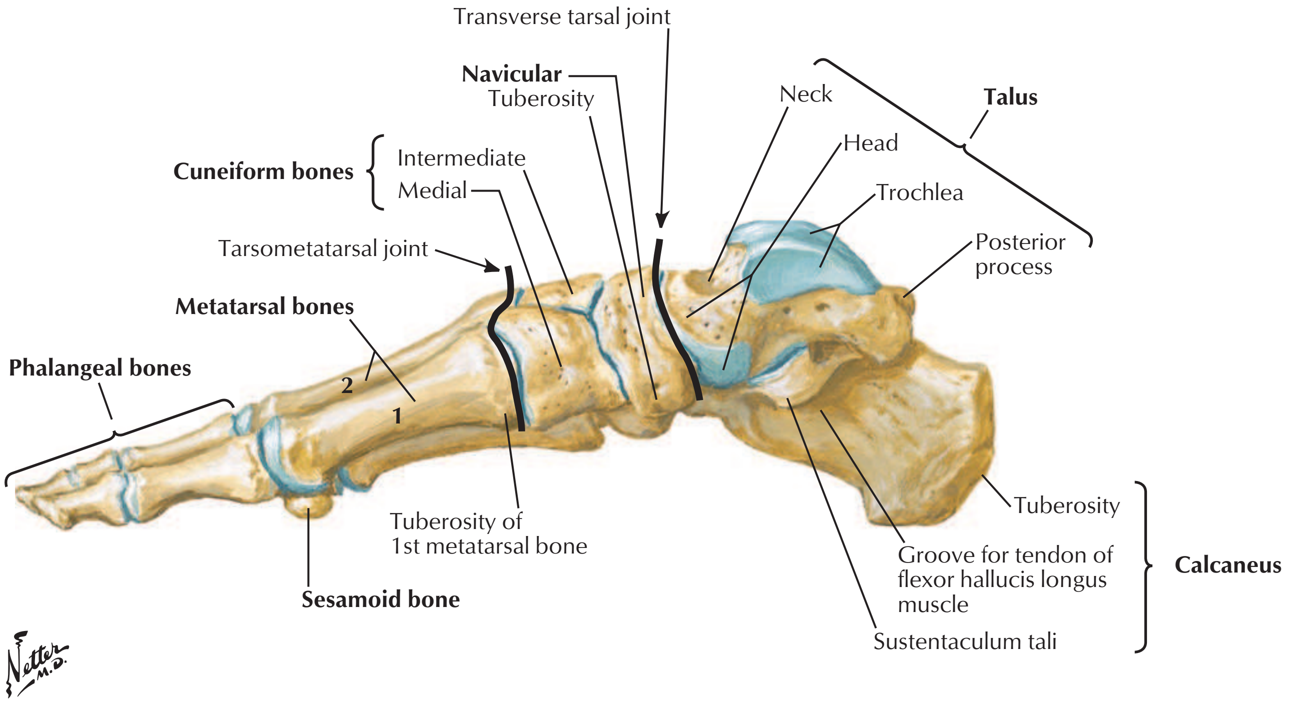
Distal
Middle
Proximal
Phalangeal bones
Base
Head
Base
Head
Body
Base
Head
Body
Lateral
Medial
Sesamoid bones
1
2
3
4
5
Metatarsal bones
Tarsometatarsal joint
Base
Medial
Intermediate
Lateral
Cuneiform bones
Tuberosity of 5th metatarsal bone
Cuboid bones
Groove for fibularis (peroneus) longus tendon
Tuberosity
Tuberosity
Navicular
Transverse tarsal joint
Calcaneus
Fibular trochlea
Groove for tendon of flexor hallucis longus muscle
Sustentaculum tali
Lateral process
Medial process
Tuberosity
Head
Posterior process
Medial tubercle
Lateral tubercle
Talus
F. Netter M.D.

See also Plate 535

Lateral view

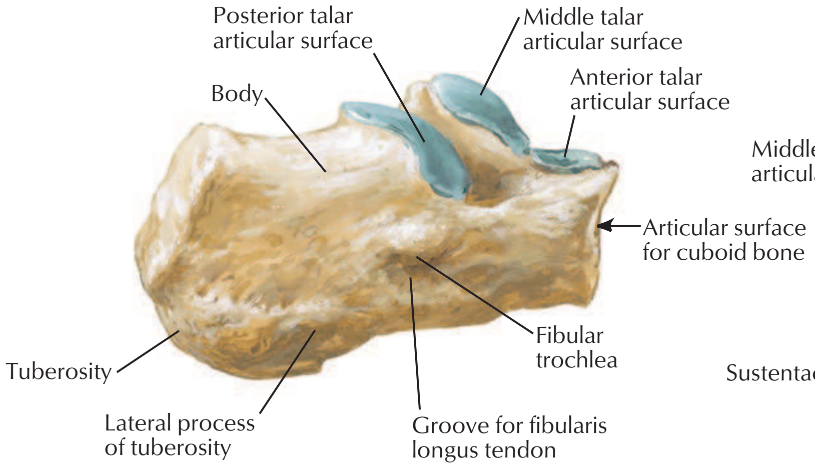

Talus
Head
Neck
Trochlea
Lateral process
Posterior process
Transverse tarsal joint
Navicular
Intermediate
Lateral
Cuneiform bones
Tarsometatarsal joint
Metatarsal bones
Phalangeal bones
2
3
4
5
Tarsal sinus
Calcaneus
Body
Fibular trochlea
Tuberosity
Groove for fibularis longus tendon
Cuboid bone
Tuberosity
Groove for fibularis (peroneus) longus tendon
Tuberosity of 5th metatarsal bone

Medial view

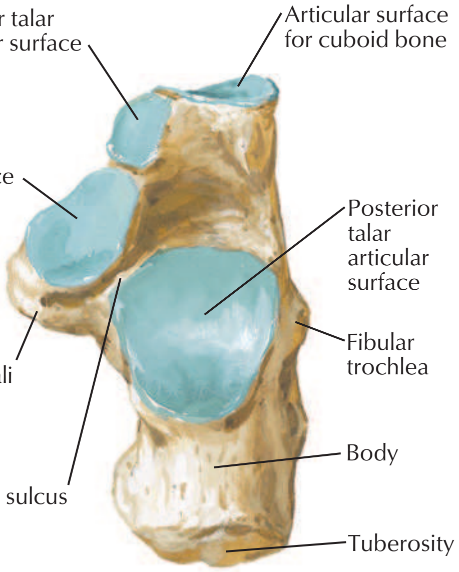

Transverse tarsal joint
Navicular
Tuberosity
Neck
Talus
Head
Trochlea
Posterior process
Cuneiform bones
Intermediate
Medial
Tarsometatarsal joint
Metatarsal bones
Phalangeal bones
2
1
Tuberosity of 1st metatarsal bone
Sesamoid bone
Tuberosity
Groove for tendon of flexor hallucis longus muscle
Sustentaculum tali
Calcaneus

See also Plate 535

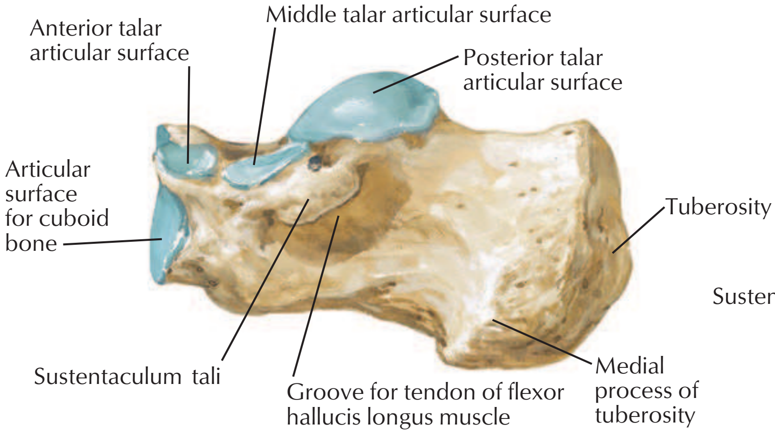
Right foot


Posterior talar articular surface
Middle talar articular surface
Body
Anterior talar articular surface
Articular surface for cuboid bone
Fibular trochlea
Tuberosity
Lateral process of tuberosity
Groove for fibularis longus tendon

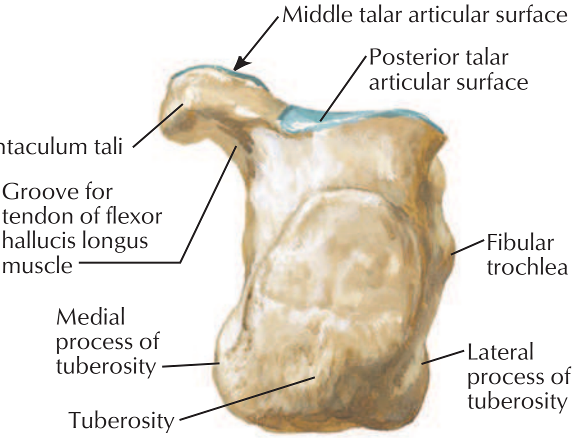
Lateral view


Anterior talar articular surface
Articular surface for cuboid bone
Middle talar articular surface
Posterior talar articular surface
Sustentaculum tali
Fibular trochlea
Body
Calcaneal sulcus
Tuberosity

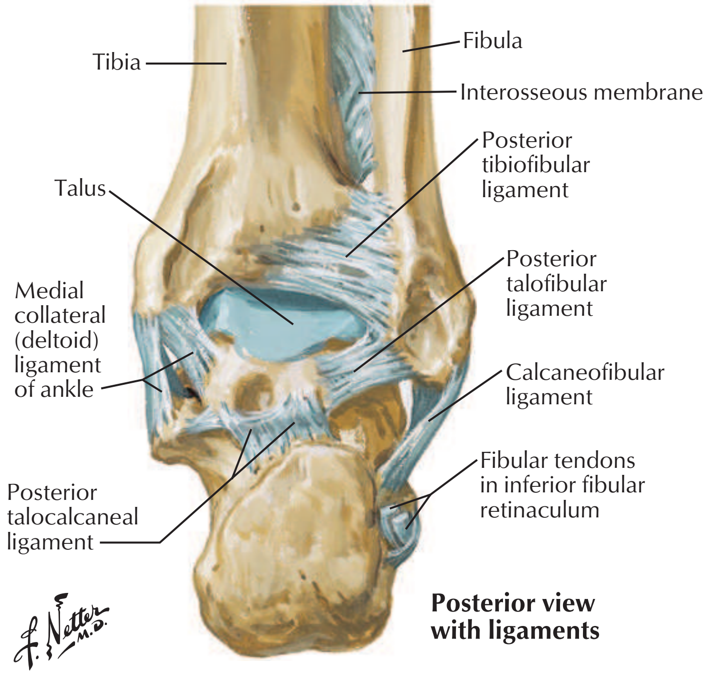
Superior view


Anterior talar articular surface
Middle talar articular surface
Posterior talar articular surface
Articular surface for cuboid bone
Tuberosity
Sustentaculum tali
Groove for tendon of flexor hallucis longus muscle
Medial process of tuberosity

Medial view

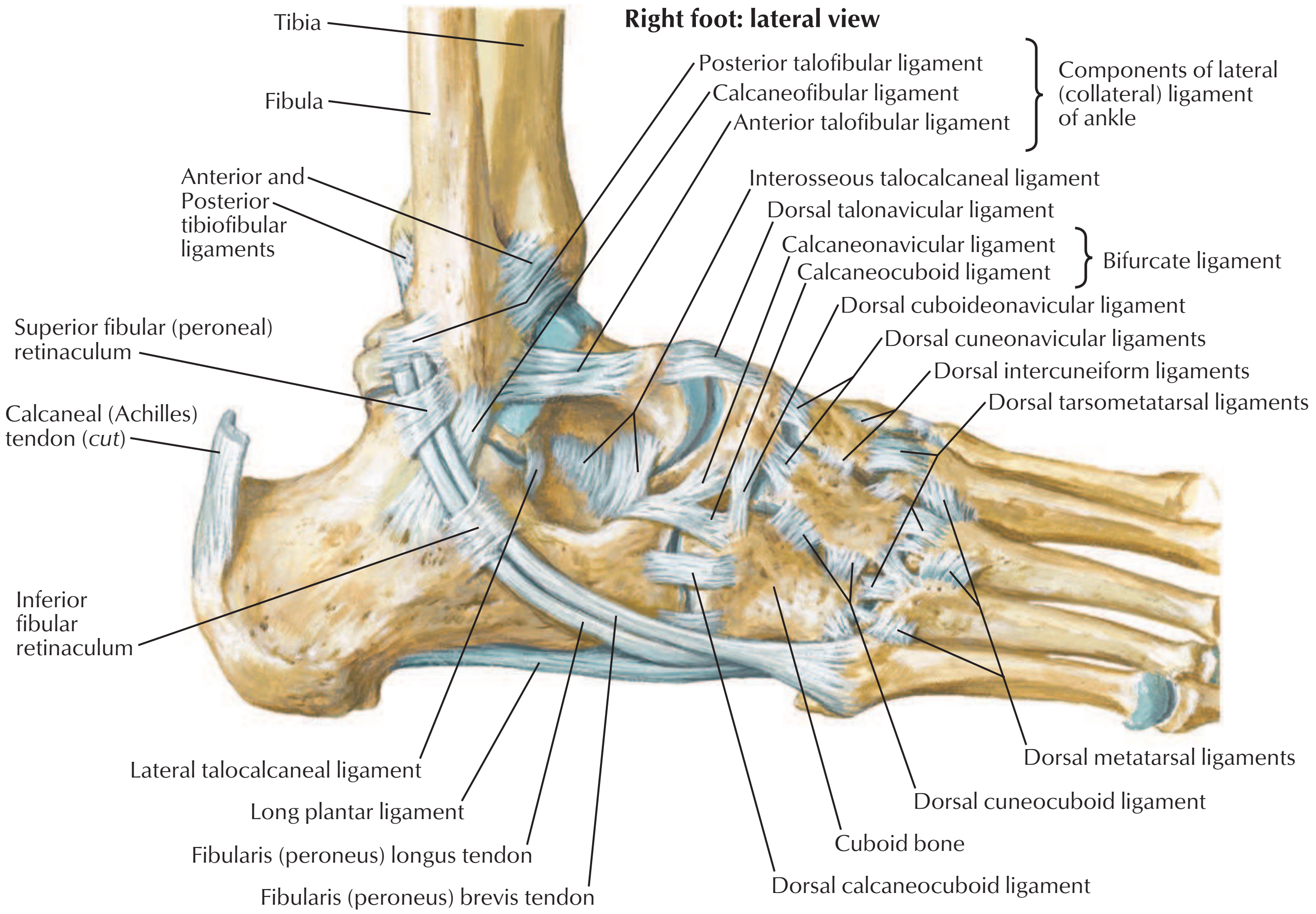

Middle talar articular surface
Posterior talar articular surface
Sustentaculum tali
Groove for tendon of flexor hallucis longus muscle
Fibular trochlea
Medial process of tuberosity
Lateral process of tuberosity
Tuberosity

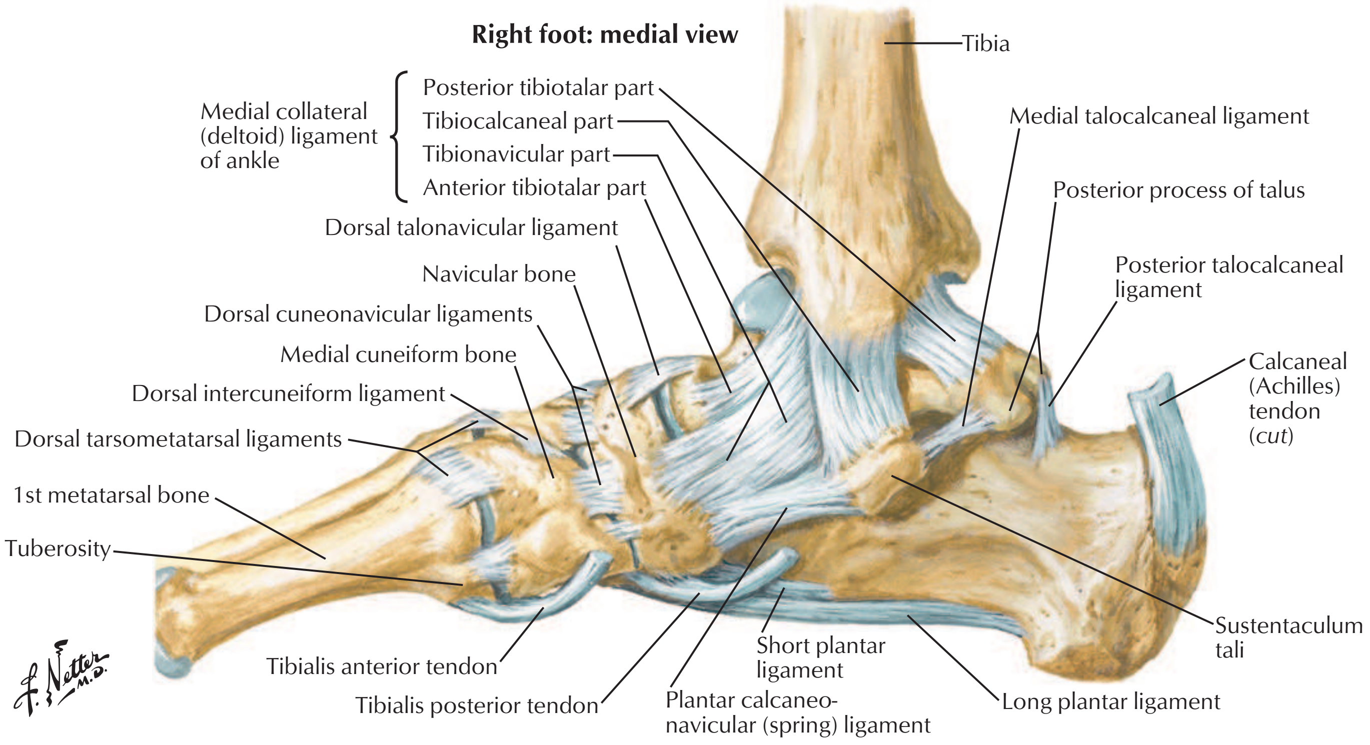
Posterior view


Tibia
Fibula
Interosseous membrane
Posterior tibiofibular ligament
Talus
Posterior talofibular ligament
Medial collateral (deltoid) ligament of ankle
Calcaneofibular ligament
Fibular tendons in inferior fibular retinaculum
Posterior talocalcaneal ligament

Posterior view with ligaments

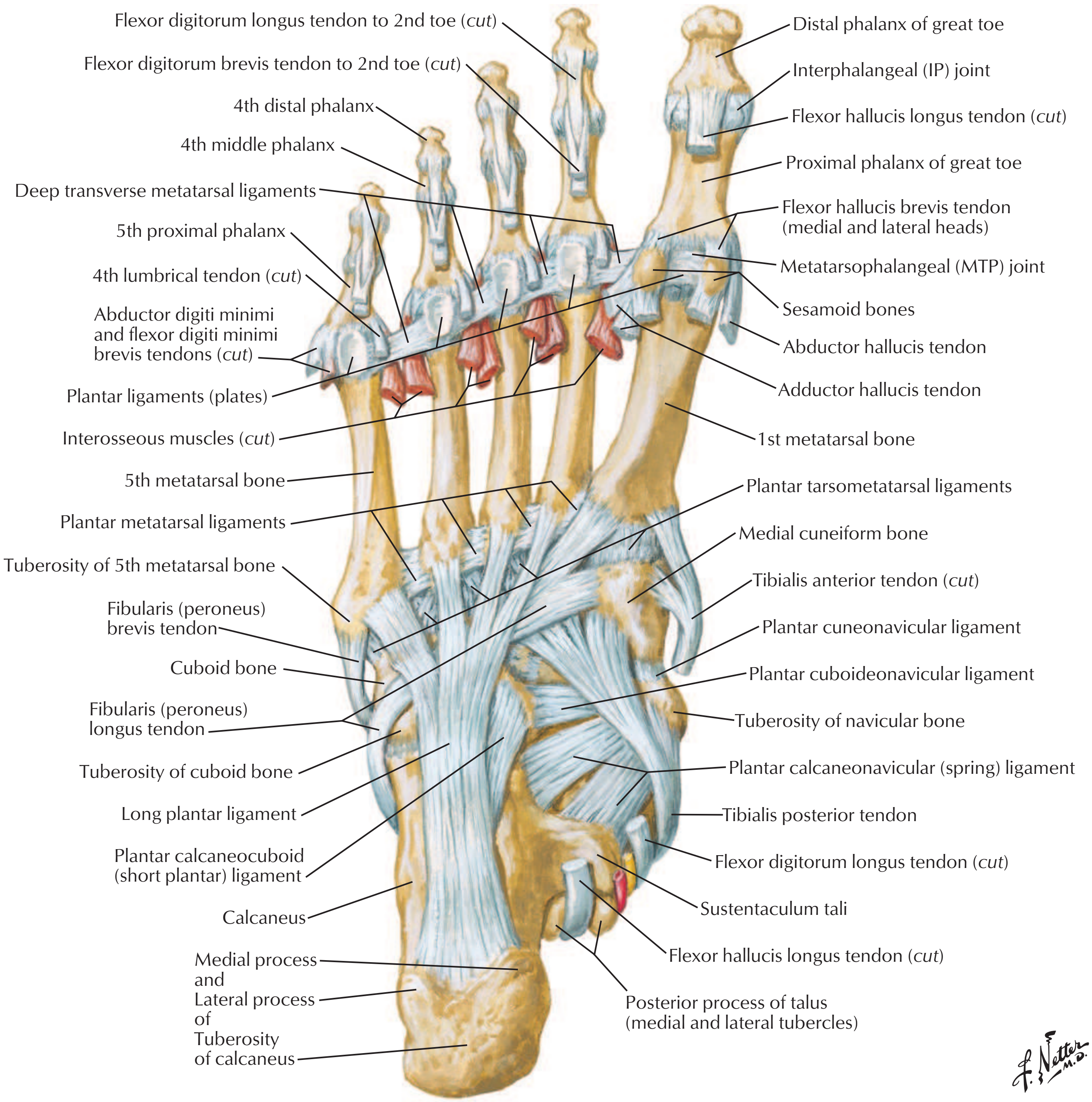
See also Plate 535

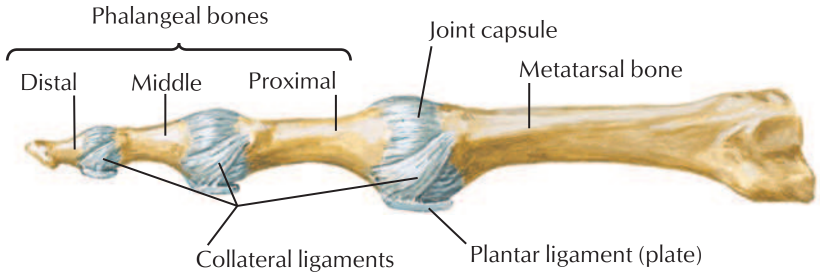

Right foot: lateral view
Tibia
Fibula
Anterior and Posterior tibiofibular ligaments
Superior fibular (peroneal) retinaculum
Calcaneal (Achilles) tendon (*cut*)
Inferior fibular retinaculum
Posterior talofibular ligament
Calcaneofibular ligament
Anterior talofibular ligament
Components of lateral (collateral) ligament of ankle
Interosseous talocalcaneal ligament
Dorsal talonavicular ligament
Calcaneonavicular ligament
Calcaneocuboid ligament
Bifurcate ligament
Dorsal cuboideonavicular ligament
Dorsal cuneonavicular ligaments
Dorsal intercuneiform ligaments
Dorsal tarsometatarsal ligaments
Lateral talocalcaneal ligament
Long plantar ligament
Fibularis (peroneus) longus tendon
Fibularis (peroneus) brevis tendon
Dorsal metatarsal ligaments
Dorsal cuneocuboid ligament
Cuboid bone
Dorsal calcaneocuboid ligament


Right foot: medial view
Tibia
Medial collateral (deltoid) ligament of ankle
Posterior tibiotalar part
Tibiocalcaneal part
Tibionavicular part
Anterior tibiotalar part
Medial talocalcaneal ligament
Posterior process of talus
Posterior talocalcaneal ligament
Calcaneal (Achilles) tendon (*cut*)
Dorsal talonavicular ligament
Navicular bone
Dorsal cuneonavicular ligaments
Medial cuneiform bone
Dorsal intercuneiform ligament
Dorsal tarsometatarsal ligaments
1st metatarsal bone
Tuberosity
Tibialis anterior tendon
Tibialis posterior tendon
Short plantar ligament
Plantar calcaneonavicular (spring) ligament
Long plantar ligament
Sustentaculum tali
F. Netter M.D.

Ligaments and Tendons of Foot: Plantar View

See also Plates 526, 527

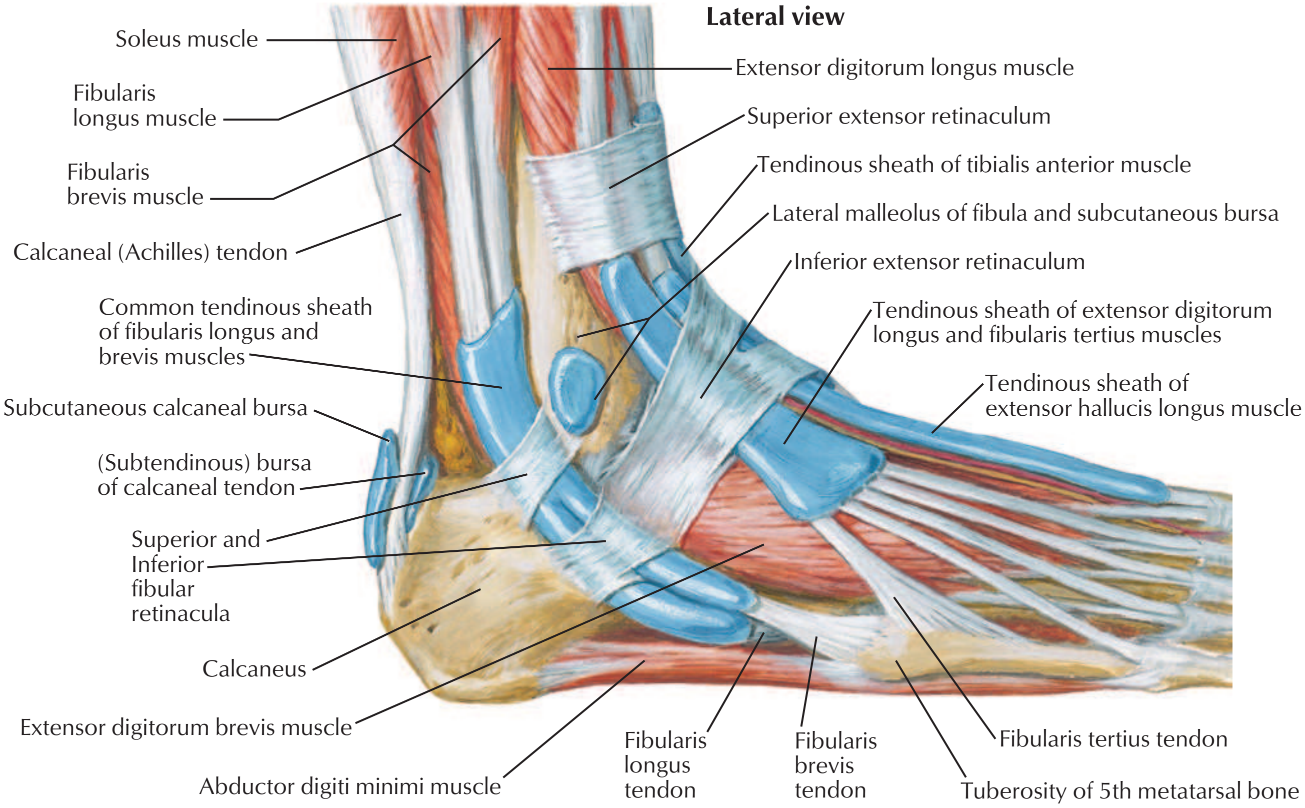

Flexor digitorum longus tendon to 2nd toe (*cut*)
Flexor digitorum brevis tendon to 2nd toe (*cut*)
4th distal phalanx
4th middle phalanx
Deep transverse metatarsal ligaments
5th proximal phalanx
4th lumbrical tendon (*cut*)
Abductor digiti minimi and flexor digiti minimi brevis tendons (*cut*)
Plantar ligaments (plates)
Interosseous muscles (*cut*)
5th metatarsal bone
Plantar metatarsal ligaments
Tuberosity of 5th metatarsal bone
Fibularis (peroneus) brevis tendon
Cuboid bone
Fibularis (peroneus) longus tendon
Tuberosity of cuboid bone
Long plantar ligament
Plantar calcaneocuboid (short plantar) ligament
Calcaneus
Medial process and Lateral process of Tuberosity of calcaneus
Distal phalanx of great toe
Interphalangeal (IP) joint
Flexor hallucis longus tendon (*cut*)
Proximal phalanx of great toe
Flexor hallucis brevis tendon (medial and lateral heads)
Metatarsophalangeal (MTP) joint
Sesamoid bones
Abductor hallucis tendon
Adductor hallucis tendon
1st metatarsal bone
Plantar tarsometatarsal ligaments
Medial cuneiform bone
Tibialis anterior tendon (*cut*)
Plantar cuneonavicular ligament
Plantar cuboideonavicular ligament
Tuberosity of navicular bone
Plantar calcaneonavicular (spring) ligament
Tibialis posterior tendon
Flexor digitorum longus tendon (*cut*)
Sustentaculum tali
Flexor hallucis longus tendon (*cut*)
Posterior process of talus (medial and lateral tubercles)


Phalangeal bones
Distal
Middle
Proximal
Joint capsule
Metatarsal bone
Collateral ligaments
Plantar ligament (plate)

Capsules and ligaments of metatarsophalangeal and interphalangeal joints: lateral view

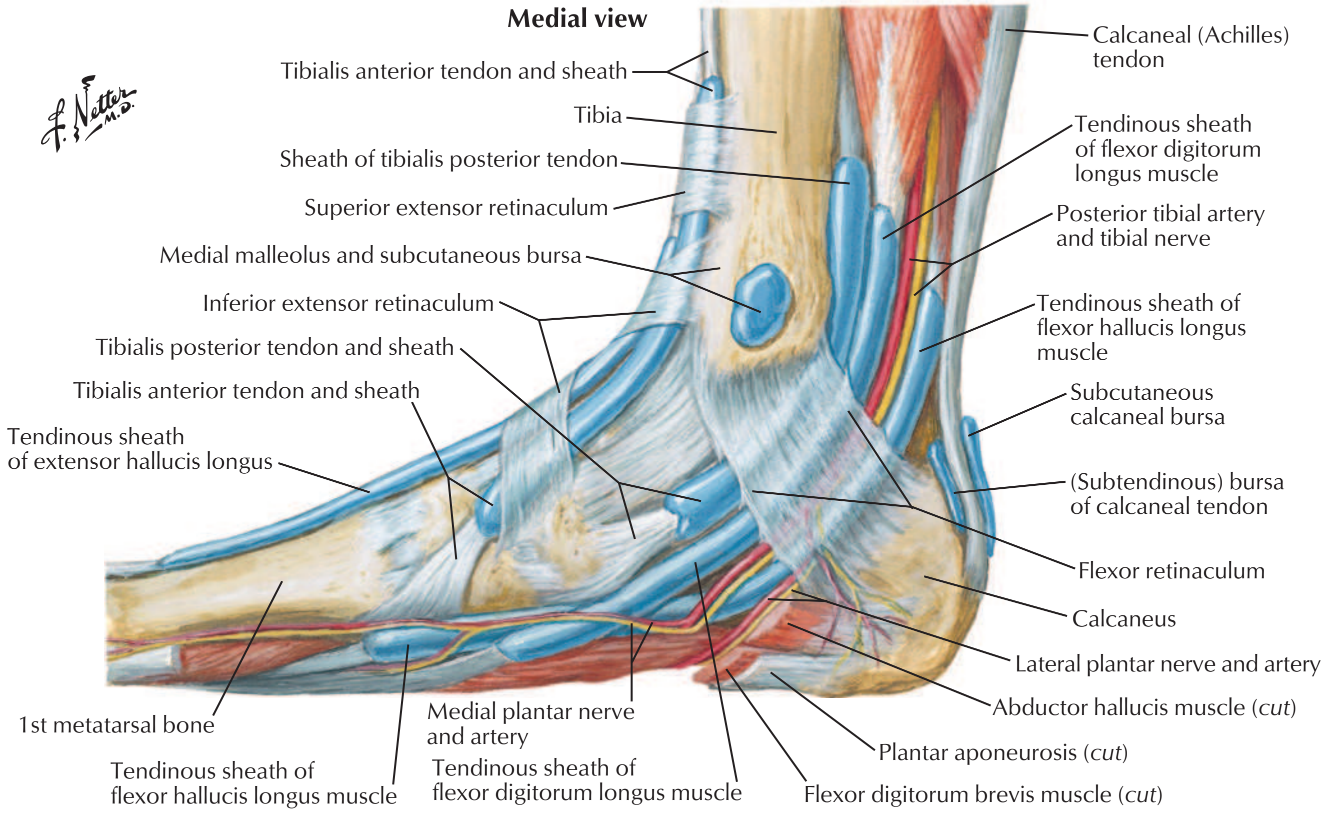
Tendon Sheaths of Ankle

See also **Plate 510**



Lateral view

Soleus muscle
Fibularis longus muscle
Fibularis brevis muscle
Calcaneal (Achilles) tendon
Common tendinous sheath of fibularis longus and brevis muscles
Subcutaneous calcaneal bursa
(Subtendinous) bursa of calcaneal tendon
Superior and Inferior fibular retinacula
Calcaneus
Extensor digitorum brevis muscle
Abductor digiti minimi muscle
Fibularis longus tendon
Fibularis brevis tendon
Tuberosity of 5th metatarsal bone
Fibularis tertius tendon
Tendinous sheath of extensor hallucis longus muscle
Tendinous sheath of extensor digitorum longus and fibularis tertius muscles
Inferior extensor retinaculum
Lateral malleolus of fibula and subcutaneous bursa
Tendinous sheath of tibialis anterior muscle
Superior extensor retinaculum
Extensor digitorum longus muscle

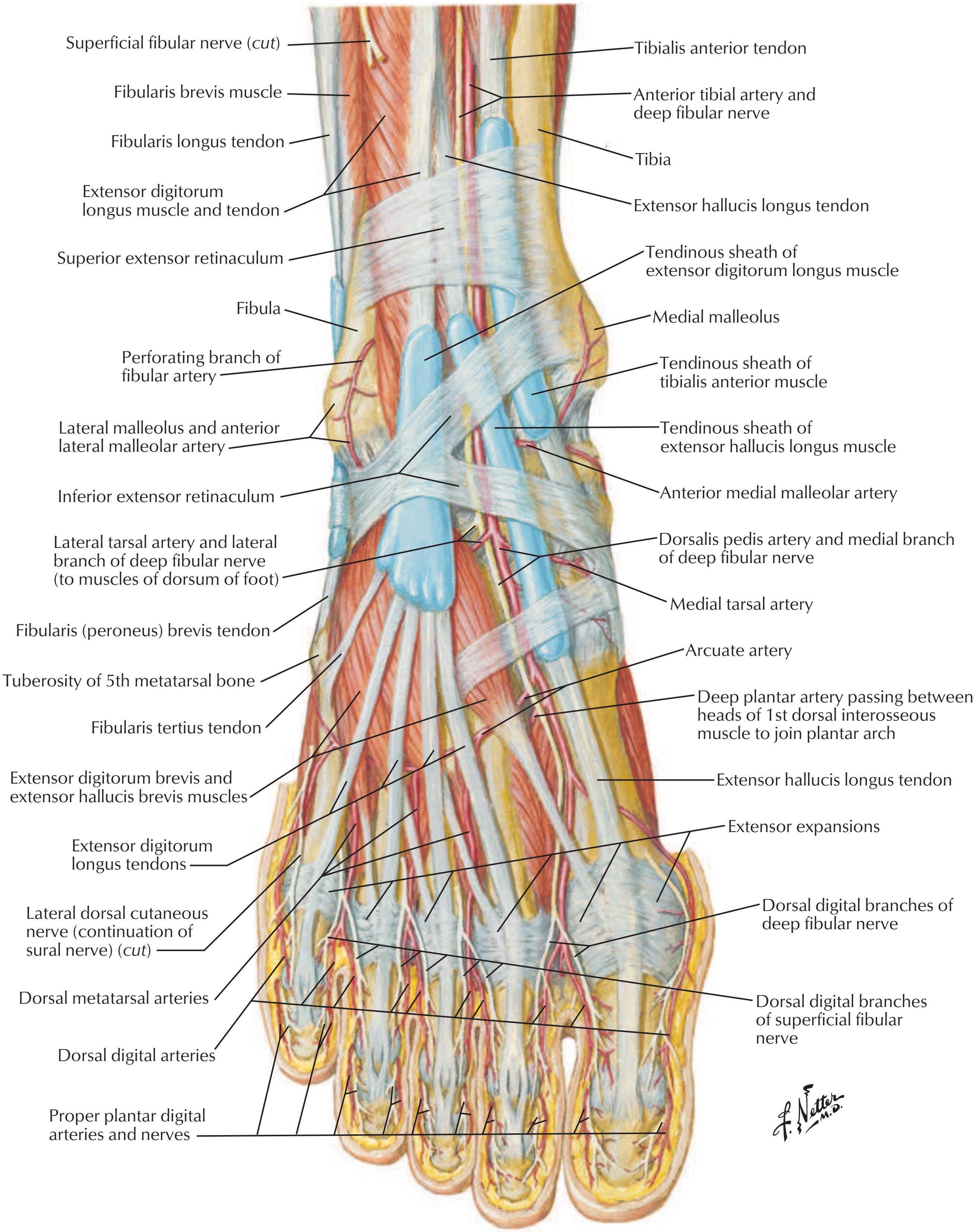


Medial view

Tibialis anterior tendon and sheath
Tibia
Sheath of tibialis posterior tendon
Superior extensor retinaculum
Medial malleolus and subcutaneous bursa
Inferior extensor retinaculum
Tibialis posterior tendon and sheath
Tibialis anterior tendon and sheath
Tendinous sheath of extensor hallucis longus
1st metatarsal bone
Tendinous sheath of flexor hallucis longus muscle
Medial plantar nerve and artery
Tendinous sheath of flexor digitorum longus muscle
Flexor digitorum brevis muscle (cut)
Plantar aponeurosis (cut)
Abductor hallucis muscle (cut)
Lateral plantar nerve and artery
Calcaneus
Flexor retinaculum
(Subtendinous) bursa of calcaneal tendon
Subcutaneous calcaneal bursa
Tendinous sheath of flexor hallucis longus muscle
Posterior tibial artery and tibial nerve
Tendinous sheath of flexor digitorum longus muscle
Calcaneal (Achilles) tendon

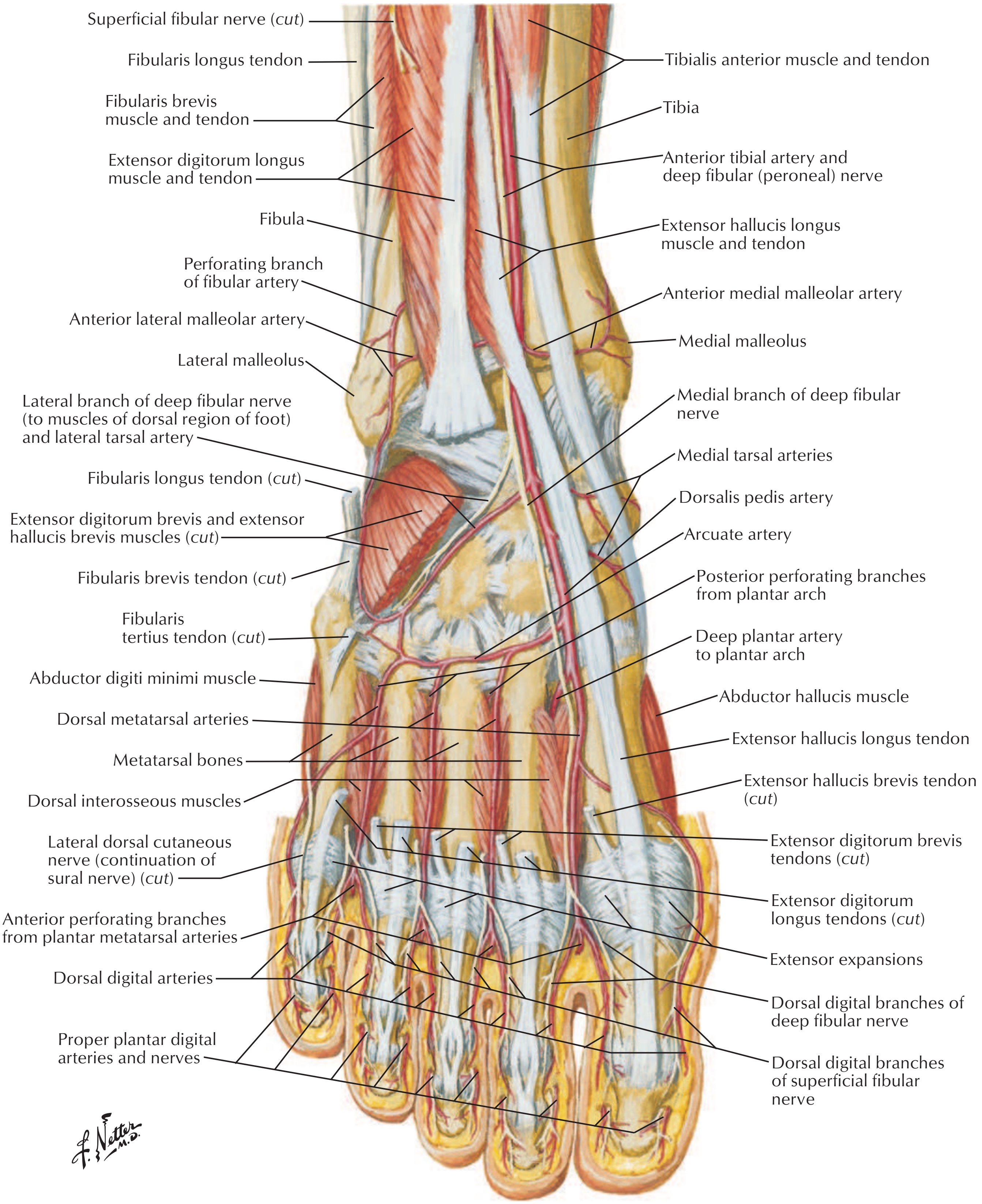
Muscles of Dorsum of Foot: Superficial Dissection

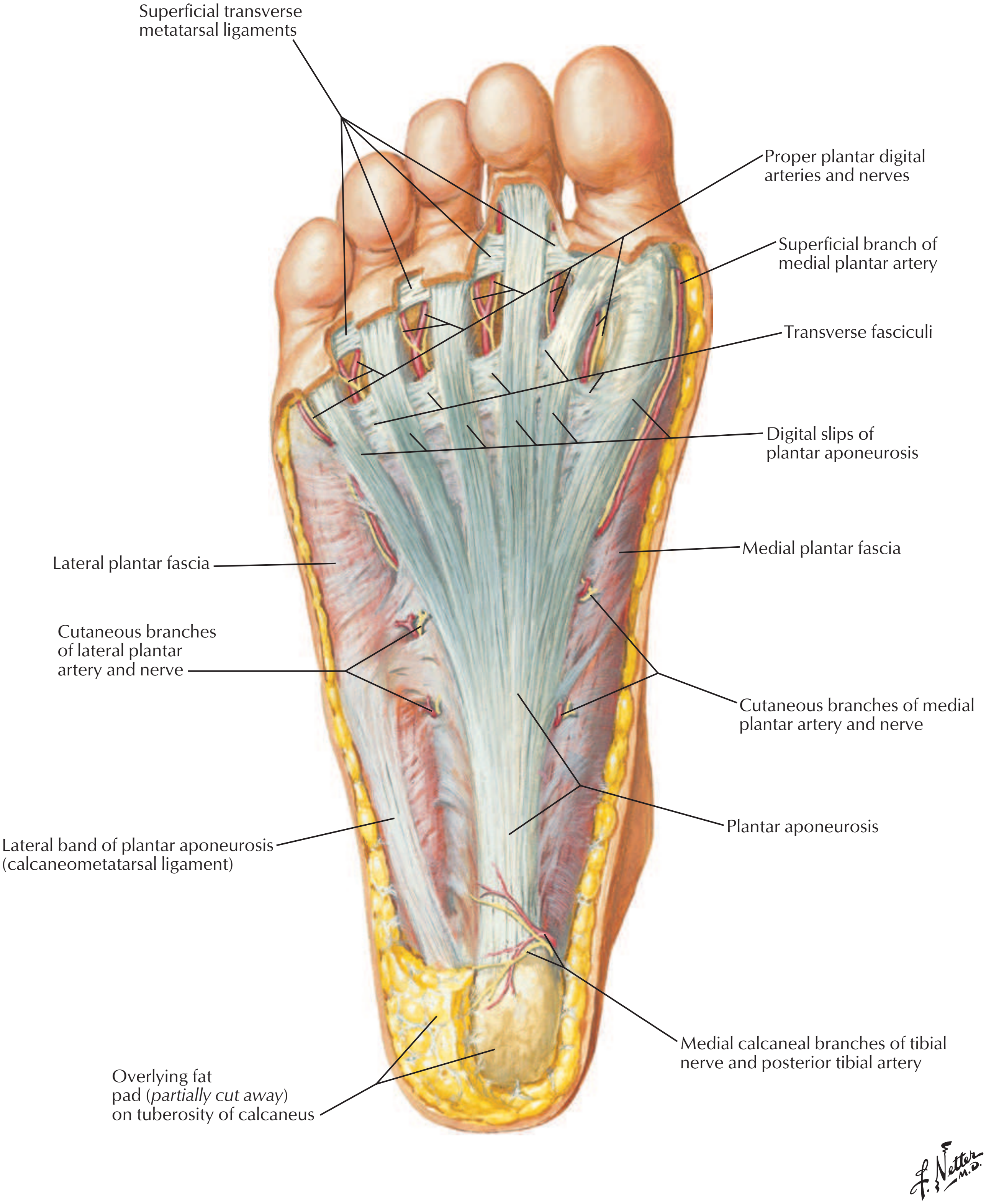
See also Plate 533


Superficial fibular nerve (*cut*)
Fibularis brevis muscle
Fibularis longus tendon
Extensor digitorum longus muscle and tendon
Superior extensor retinaculum
Fibula
Perforating branch of fibular artery
Lateral malleolus and anterior lateral malleolar artery
Inferior extensor retinaculum
Lateral tarsal artery and lateral branch of deep fibular nerve (to muscles of dorsum of foot)
Fibularis (peroneus) brevis tendon
Tuberosity of 5th metatarsal bone
Fibularis tertius tendon
Extensor digitorum brevis and extensor hallucis brevis muscles
Extensor digitorum longus tendons
Lateral dorsal cutaneous nerve (continuation of sural nerve) (*cut*)
Dorsal metatarsal arteries
Dorsal digital arteries
Proper plantar digital arteries and nerves
Tibialis anterior tendon
Anterior tibial artery and deep fibular nerve
Tibia
Extensor hallucis longus tendon
Tendinous sheath of extensor digitorum longus muscle
Medial malleolus
Tendinous sheath of tibialis anterior muscle
Tendinous sheath of extensor hallucis longus muscle
Anterior medial malleolar artery
Dorsalis pedis artery and medial branch of deep fibular nerve
Medial tarsal artery
Arcuate artery
Deep plantar artery passing between heads of 1st dorsal interosseous muscle to join plantar arch
Extensor hallucis longus tendon
Extensor expansions
Dorsal digital branches of deep fibular nerve
Dorsal digital branches of superficial fibular nerve
F. Netter M.D.

Dorsum of Foot: Deep Dissection

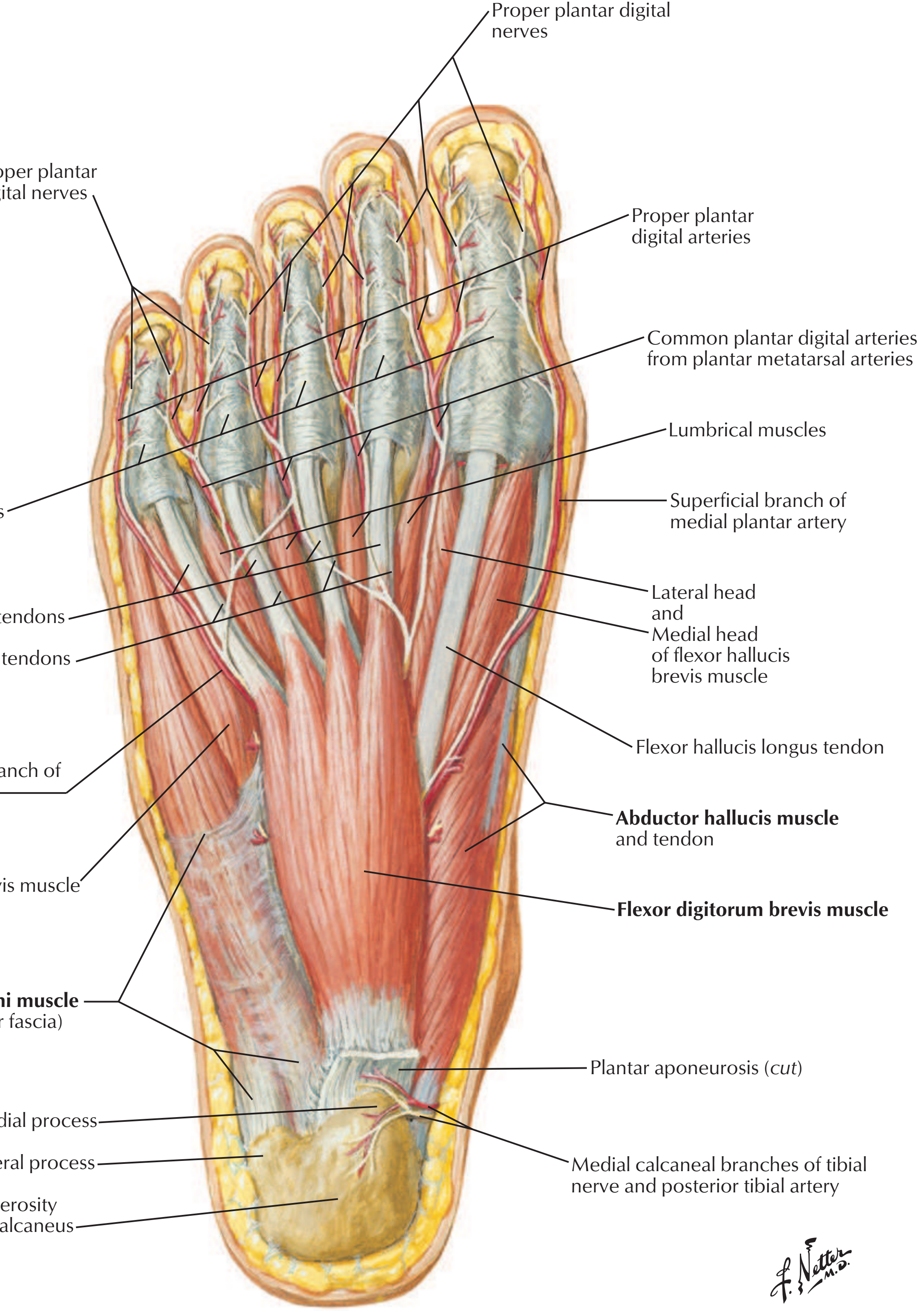
See also Plate 527


Superficial fibular nerve (*cut*)
Fibularis longus tendon
Fibularis brevis muscle and tendon
Extensor digitorum longus muscle and tendon
Fibula
Perforating branch of fibular artery
Anterior lateral malleolar artery
Lateral malleolus
Lateral branch of deep fibular nerve (to muscles of dorsal region of foot) and lateral tarsal artery
Fibularis longus tendon (*cut*)
Extensor digitorum brevis and extensor hallucis brevis muscles (*cut*)
Fibularis brevis tendon (*cut*)
Fibularis tertius tendon (*cut*)
Abductor digiti minimi muscle
Dorsal metatarsal arteries
Metatarsal bones
Dorsal interosseous muscles
Lateral dorsal cutaneous nerve (continuation of sural nerve) (*cut*)
Anterior perforating branches from plantar metatarsal arteries
Dorsal digital arteries
Proper plantar digital arteries and nerves
Tibialis anterior muscle and tendon
Tibia
Anterior tibial artery and deep fibular (peroneal) nerve
Extensor hallucis longus muscle and tendon
Anterior medial malleolar artery
Medial malleolus
Medial branch of deep fibular nerve
Medial tarsal arteries
Dorsalis pedis artery
Arcuate artery
Posterior perforating branches from plantar arch
Deep plantar artery to plantar arch
Abductor hallucis muscle
Extensor hallucis longus tendon
Extensor hallucis brevis tendon (*cut*)
Extensor digitorum brevis tendons (*cut*)
Extensor digitorum longus tendons (*cut*)
Extensor expansions
Dorsal digital branches of deep fibular nerve
Dorsal digital branches of superficial fibular nerve


Superficial transverse metatarsal ligaments
Proper plantar digital arteries and nerves
Superficial branch of medial plantar artery
Transverse fasciculi
Digital slips of plantar aponeurosis
Lateral plantar fascia
Medial plantar fascia
Cutaneous branches of lateral plantar artery and nerve
Cutaneous branches of medial plantar artery and nerve
Plantar aponeurosis
Lateral band of plantar aponeurosis (calcaneometatarsal ligament)
Medial calcaneal branches of tibial nerve and posterior tibial artery
Overlying fat pad (*partially cut away*) on tuberosity of calcaneus
F. Netter M.D.

See also **Plate 532**

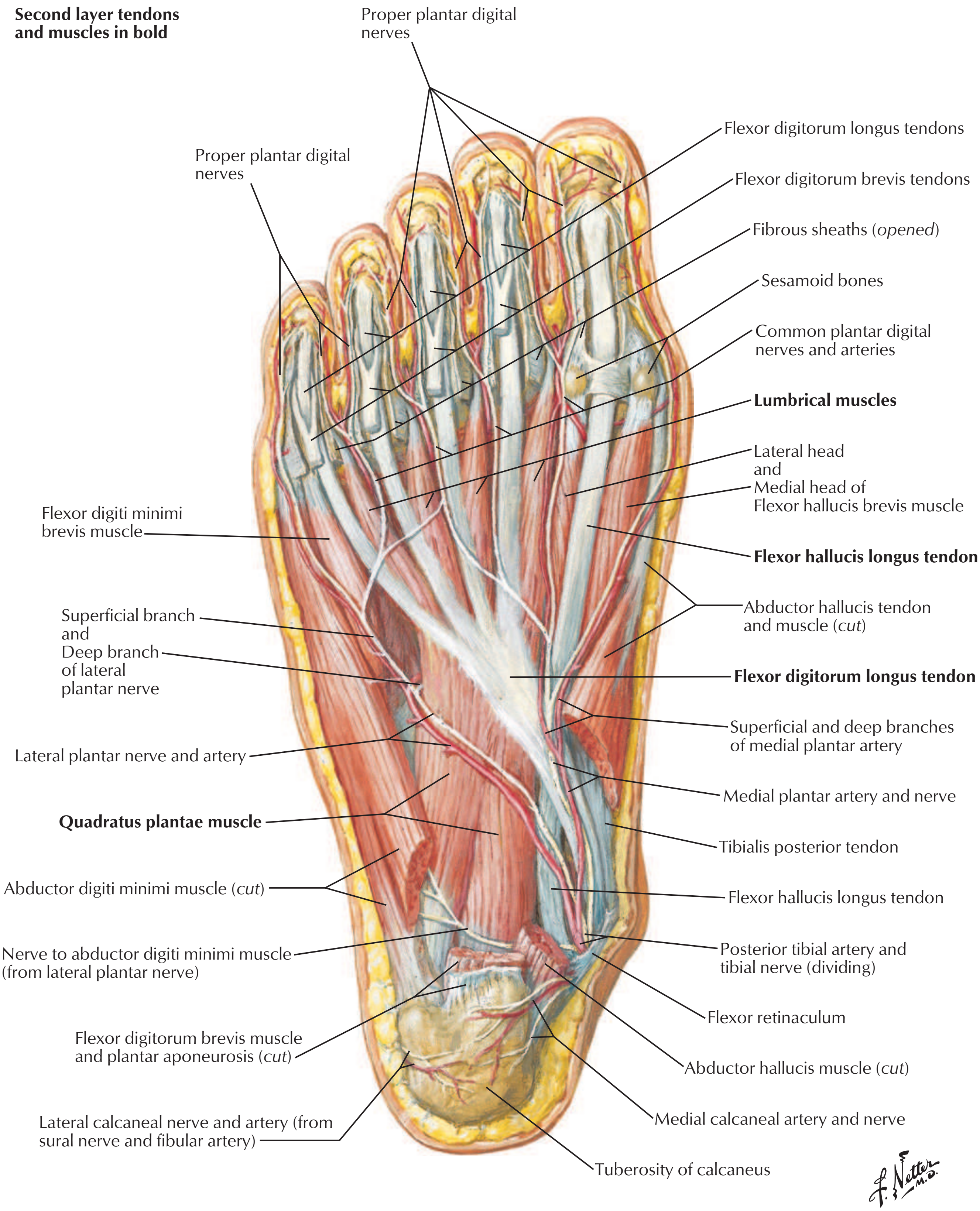
First layer muscles in bold

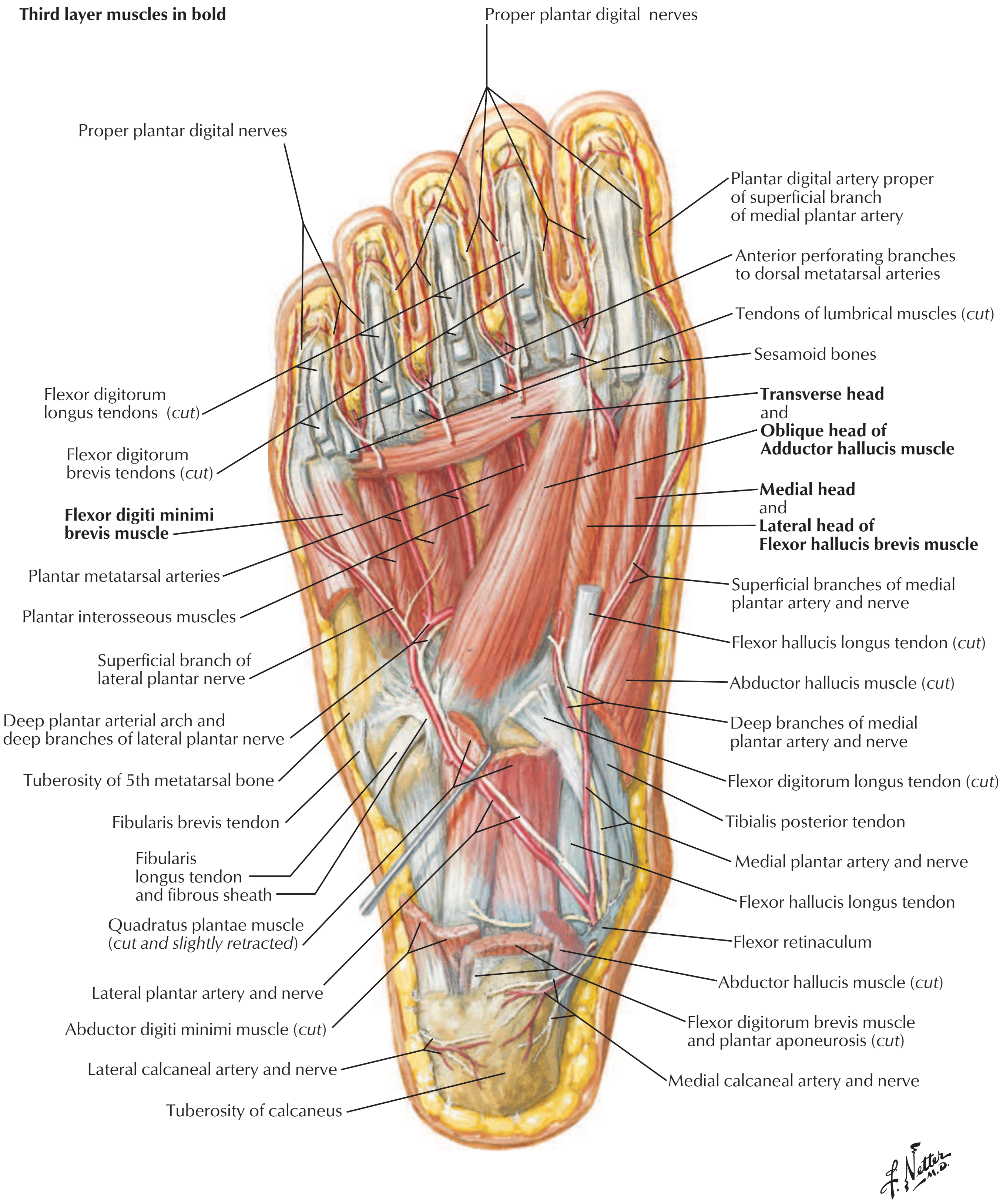


Proper plantar digital nerves
Proper plantar digital nerves
Proper plantar digital arteries
Common plantar digital arteries from plantar metatarsal arteries
Lumbrical muscles
Fibrous sheaths of flexor tendons
Superficial branch of medial plantar artery
Flexor digitorum brevis tendons overlying Flexor digitorum longus tendons
Lateral head and Medial head of flexor hallucis brevis muscle
Flexor hallucis longus tendon
Plantar metatarsal branch of lateral plantar artery
Abductor hallucis muscle and tendon
Flexor digiti minimi brevis muscle
Flexor digitorum brevis muscle
Abductor digiti minimi muscle (deep to lateral plantar fascia)
Plantar aponeurosis (*cut*)
Medial process and Lateral process of Tuberosity of calcaneus
Medial calcaneal branches of tibial nerve and posterior tibial artery
F. Netter M.D.

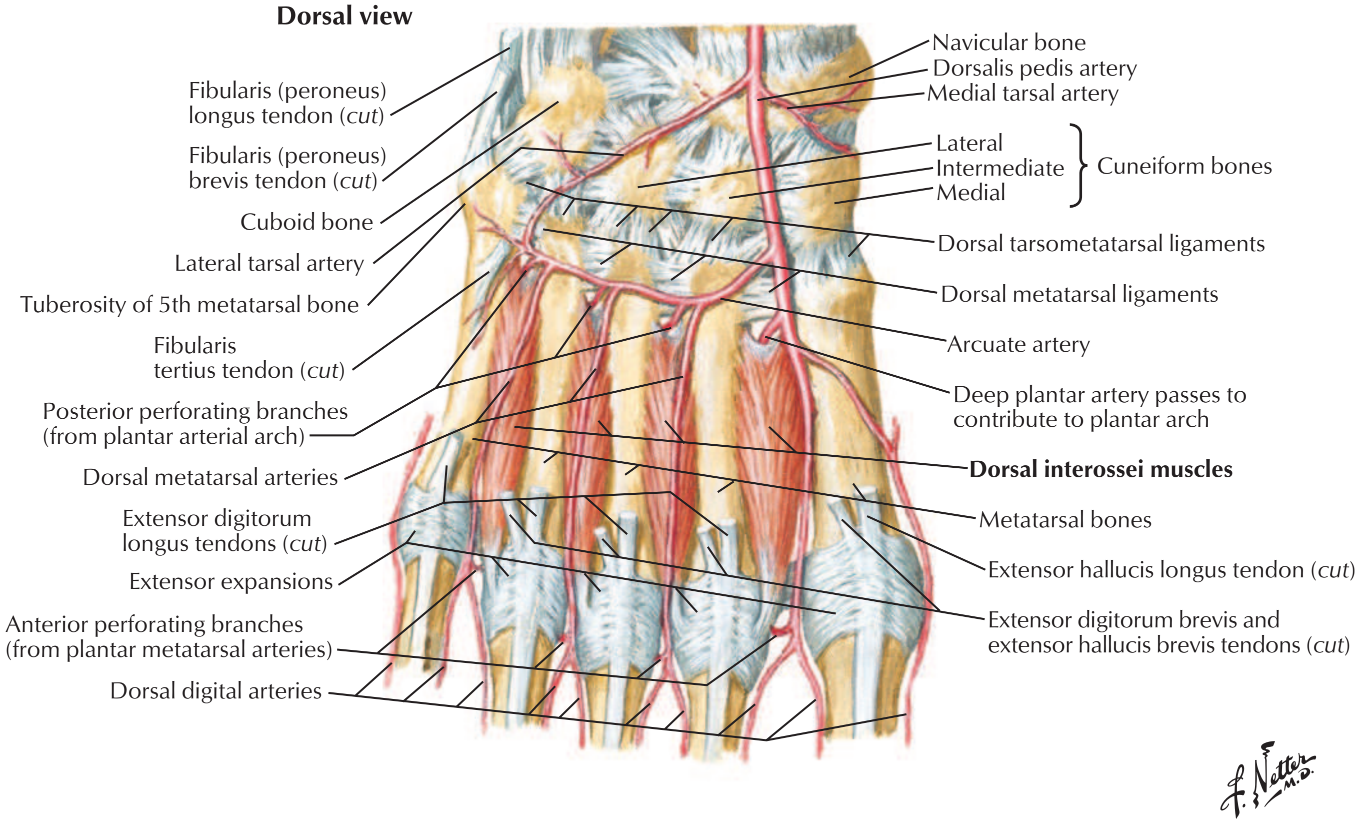
Muscles of Plantar Region of Foot: Second Layer

See also Plate 532

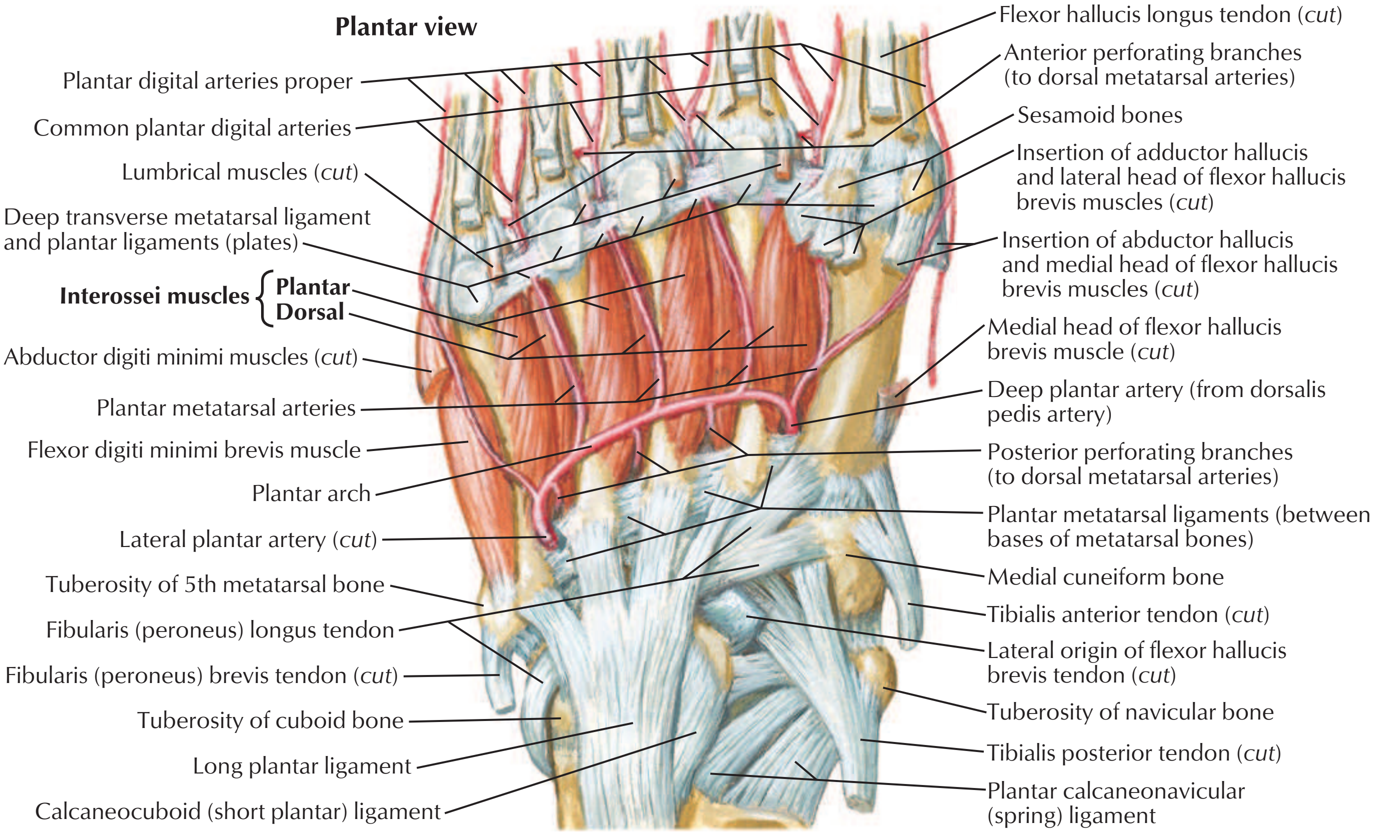

Second layer tendons and muscles in bold
Proper plantar digital nerves
Proper plantar digital nerves
Flexor digitorum longus tendons
Flexor digitorum brevis tendons
Fibrous sheaths (*opened*)
Sesamoid bones
Common plantar digital nerves and arteries
Lumbrical muscles
Lateral head and Medial head of Flexor hallucis brevis muscle
Flexor hallucis longus tendon
Abductor hallucis tendon and muscle (*cut*)
Flexor digitorum longus tendon
Superficial and deep branches of medial plantar artery
Medial plantar artery and nerve
Tibialis posterior tendon
Flexor hallucis longus tendon
Posterior tibial artery and tibial nerve (dividing)
Flexor retinaculum
Abductor hallucis muscle (*cut*)
Medial calcaneal artery and nerve
Tuberosity of calcaneus
Flexor digiti minimi brevis muscle
Superficial branch and Deep branch of lateral plantar nerve
Lateral plantar nerve and artery
Quadratus plantae muscle
Abductor digiti minimi muscle (*cut*)
Nerve to abductor digiti minimi muscle (from lateral plantar nerve)
Flexor digitorum brevis muscle and plantar aponeurosis (*cut*)
Lateral calcaneal nerve and artery (from sural nerve and fibular artery)
F. Netter M.D.


Third layer muscles in bold
Proper plantar digital nerves
Proper plantar digital nerves
Plantar digital artery proper of superficial branch of medial plantar artery
Anterior perforating branches to dorsal metatarsal arteries
Tendons of lumbrical muscles (*cut*)
Sesamoid bones
Transverse head and **Oblique head of Adductor hallucis muscle**
Medial head and **Lateral head of Flexor hallucis brevis muscle**
Flexor digitorum longus tendons (*cut*)
Flexor digitorum brevis tendons (*cut*)
Flexor digiti minimi brevis muscle
Plantar metatarsal arteries
Plantar interosseous muscles
Superficial branch of lateral plantar nerve
Deep plantar arterial arch and deep branches of lateral plantar nerve
Tuberosity of 5th metatarsal bone
Fibularis brevis tendon
Fibularis longus tendon and fibrous sheath
Quadratus plantae muscle (*cut and slightly retracted*)
Lateral plantar artery and nerve
Abductor digiti minimi muscle (*cut*)
Lateral calcaneal artery and nerve
Tuberosity of calcaneus
Superficial branches of medial plantar artery and nerve
Flexor hallucis longus tendon (*cut*)
Abductor hallucis muscle (*cut*)
Deep branches of medial plantar artery and nerve
Flexor digitorum longus tendon (*cut*)
Tibialis posterior tendon
Medial plantar artery and nerve
Flexor hallucis longus tendon
Flexor retinaculum
Abductor hallucis muscle (*cut*)
Flexor digitorum brevis muscle and plantar aponeurosis (*cut*)
Medial calcaneal artery and nerve

Dorsal view


Fibularis (peroneus) longus tendon (*cut*)
Fibularis (peroneus) brevis tendon (*cut*)
Cuboid bone
Lateral tarsal artery
Tuberosity of 5th metatarsal bone
Fibularis tertius tendon (*cut*)
Posterior perforating branches (from plantar arterial arch)
Dorsal metatarsal arteries
Extensor digitorum longus tendons (*cut*)
Extensor expansions
Anterior perforating branches (from plantar metatarsal arteries)
Dorsal digital arteries
Navicular bone
Dorsalis pedis artery
Medial tarsal artery
Lateral
Intermediate
Medial
Cuneiform bones
Dorsal tarsometatarsal ligaments
Dorsal metatarsal ligaments
Arcuate artery
Deep plantar artery passes to contribute to plantar arch
Dorsal interossei muscles
Metatarsal bones
Extensor hallucis longus tendon (*cut*)
Extensor digitorum brevis and extensor hallucis brevis tendons (*cut*)
F. Netter M.D.

Plantar view

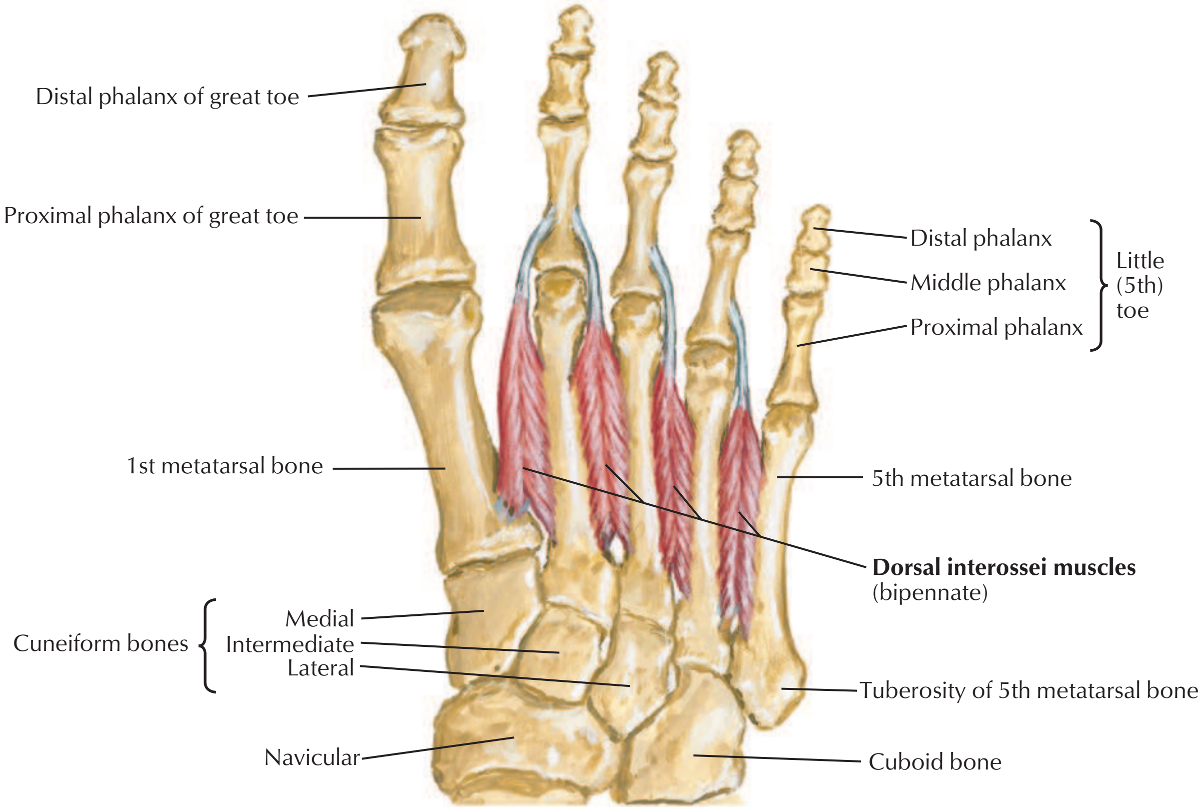

Plantar digital arteries proper
Common plantar digital arteries
Lumbrical muscles (*cut*)
Deep transverse metatarsal ligament and plantar ligaments (plates)
Interossei muscles **Plantar** **Dorsal**
Abductor digiti minimi muscles (*cut*)
Plantar metatarsal arteries
Flexor digiti minimi brevis muscle
Plantar arch
Lateral plantar artery (*cut*)
Tuberosity of 5th metatarsal bone
Fibularis (peroneus) longus tendon
Fibularis (peroneus) brevis tendon (*cut*)
Tuberosity of cuboid bone
Long plantar ligament
Calcaneocuboid (short plantar) ligament
Flexor hallucis longus tendon (*cut*)
Anterior perforating branches (to dorsal metatarsal arteries)
Sesamoid bones
Insertion of adductor hallucis and lateral head of flexor hallucis brevis muscles (*cut*)
Insertion of abductor hallucis and medial head of flexor hallucis brevis muscles (*cut*)
Medial head of flexor hallucis brevis muscle (*cut*)
Deep plantar artery (from dorsalis pedis artery)
Posterior perforating branches (to dorsal metatarsal arteries)
Plantar metatarsal ligaments (between bases of metatarsal bones)
Medial cuneiform bone
Tibialis anterior tendon (*cut*)
Lateral origin of flexor hallucis brevis tendon (*cut*)
Tuberosity of navicular bone
Tibialis posterior tendon (*cut*)
Plantar calcaneonavicular (spring) ligament

Fourth layer muscles in bold

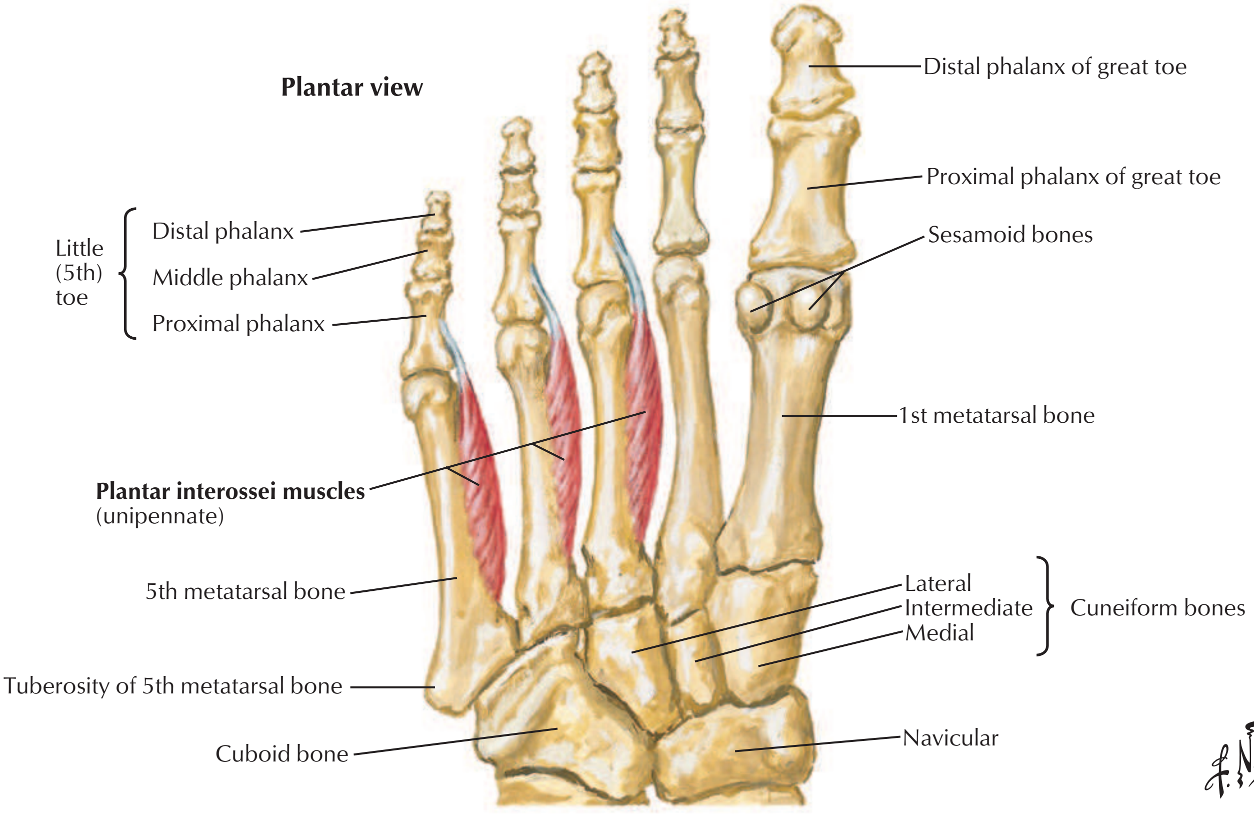
Interosseous Muscles of Foot

See also Plate 527

Dorsal view

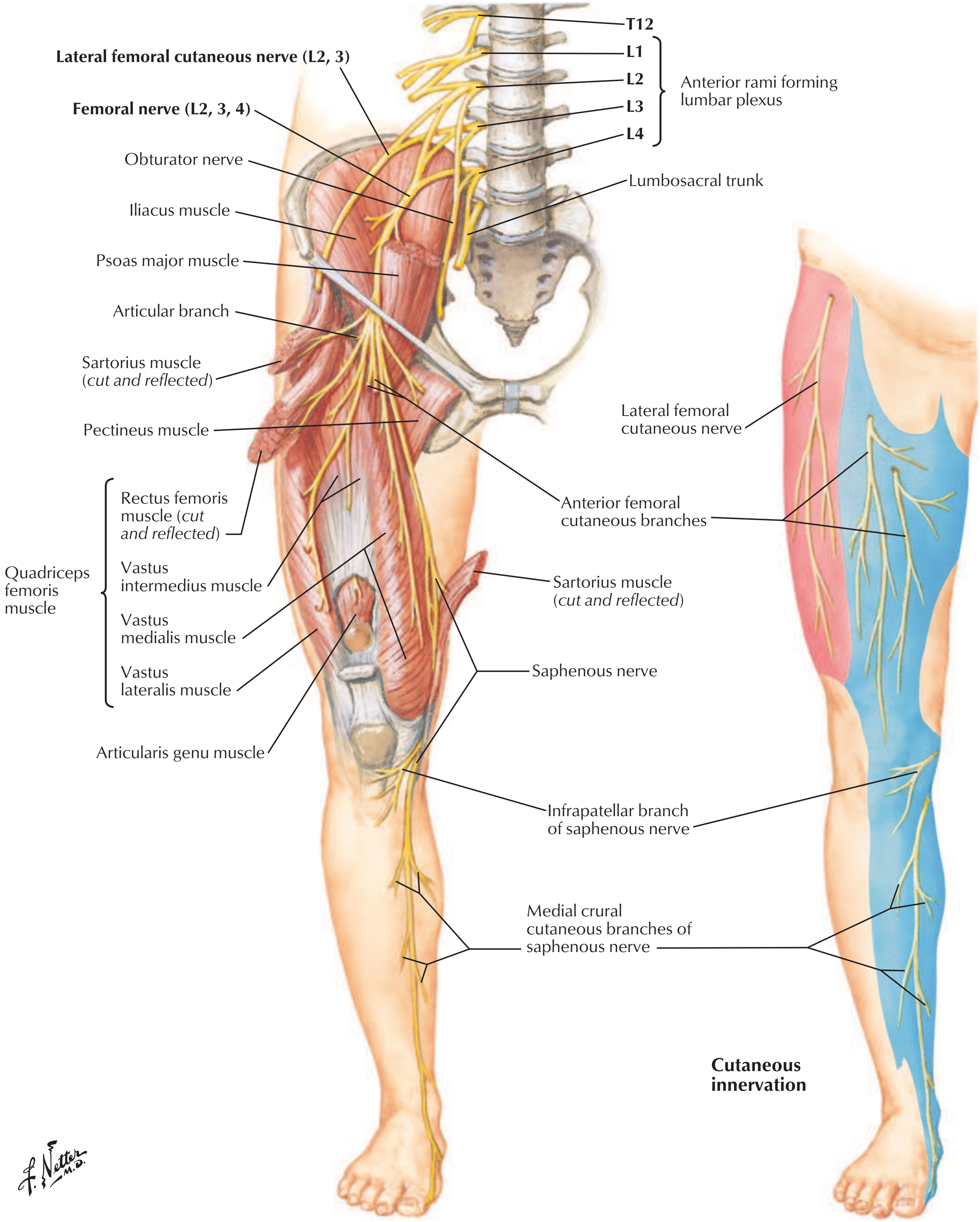

Distal phalanx of great toe
Proximal phalanx of great toe
1st metatarsal bone
Cuneiform bones
Medial
Intermediate
Lateral
Navicular
Distal phalanx
Middle phalanx
Proximal phalanx
Little (5th) toe
5th metatarsal bone
Dorsal interossei muscles (bipennate)
Tuberosity of 5th metatarsal bone
Cuboid bone

Plantar view


Distal phalanx of great toe
Proximal phalanx of great toe
Sesamoid bones
1st metatarsal bone
Little (5th) toe
Distal phalanx
Middle phalanx
Proximal phalanx
Plantar interossei muscles (unipennate)
5th metatarsal bone
Tuberosity of 5th metatarsal bone
Cuboid bone
Lateral
Intermediate
Medial
Cuneiform bones
Navicular

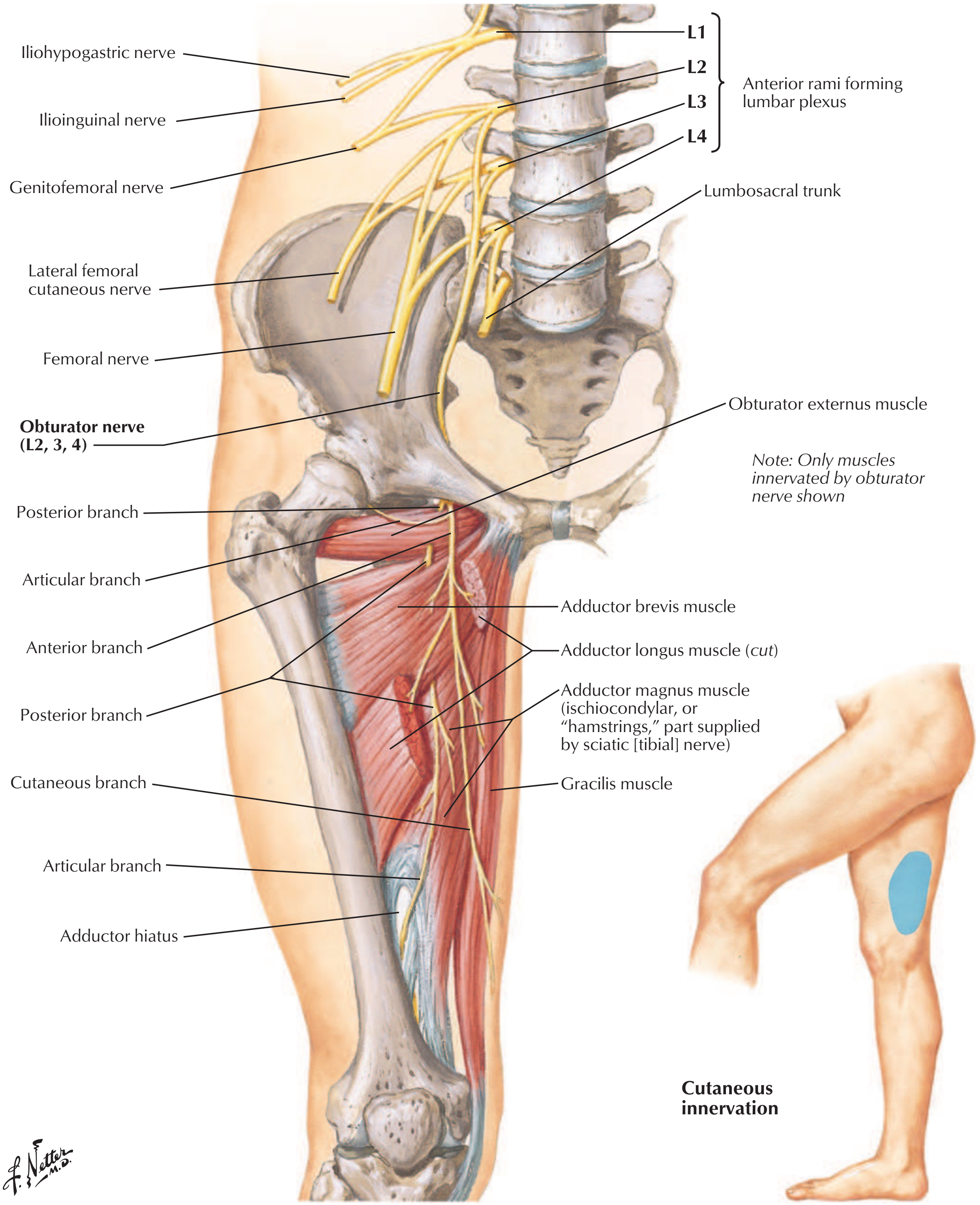
Femoral Nerve and Lateral Femoral Cutaneous Nerve

See also Plates 269, 490, 491


T12
L1
L2
L3
L4
Anterior rami forming lumbar plexus
Lateral femoral cutaneous nerve (L2, 3)
Femoral nerve (L2, 3, 4)
Obturator nerve
Lumbosacral trunk
Iliacus muscle
Psoas major muscle
Articular branch
Sartorius muscle (cut and reflected)
Pectineus muscle
Lateral femoral cutaneous nerve
Quadriceps femoris muscle
Rectus femoris muscle (cut and reflected)
Vastus intermedius muscle
Vastus medialis muscle
Vastus lateralis muscle
Anterior femoral cutaneous branches
Sartorius muscle (cut and reflected)
Saphenous nerve
Articularis genu muscle
Infrapatellar branch of saphenous nerve
Medial crural cutaneous branches of saphenous nerve
Cutaneous innervation

Obturator Nerve

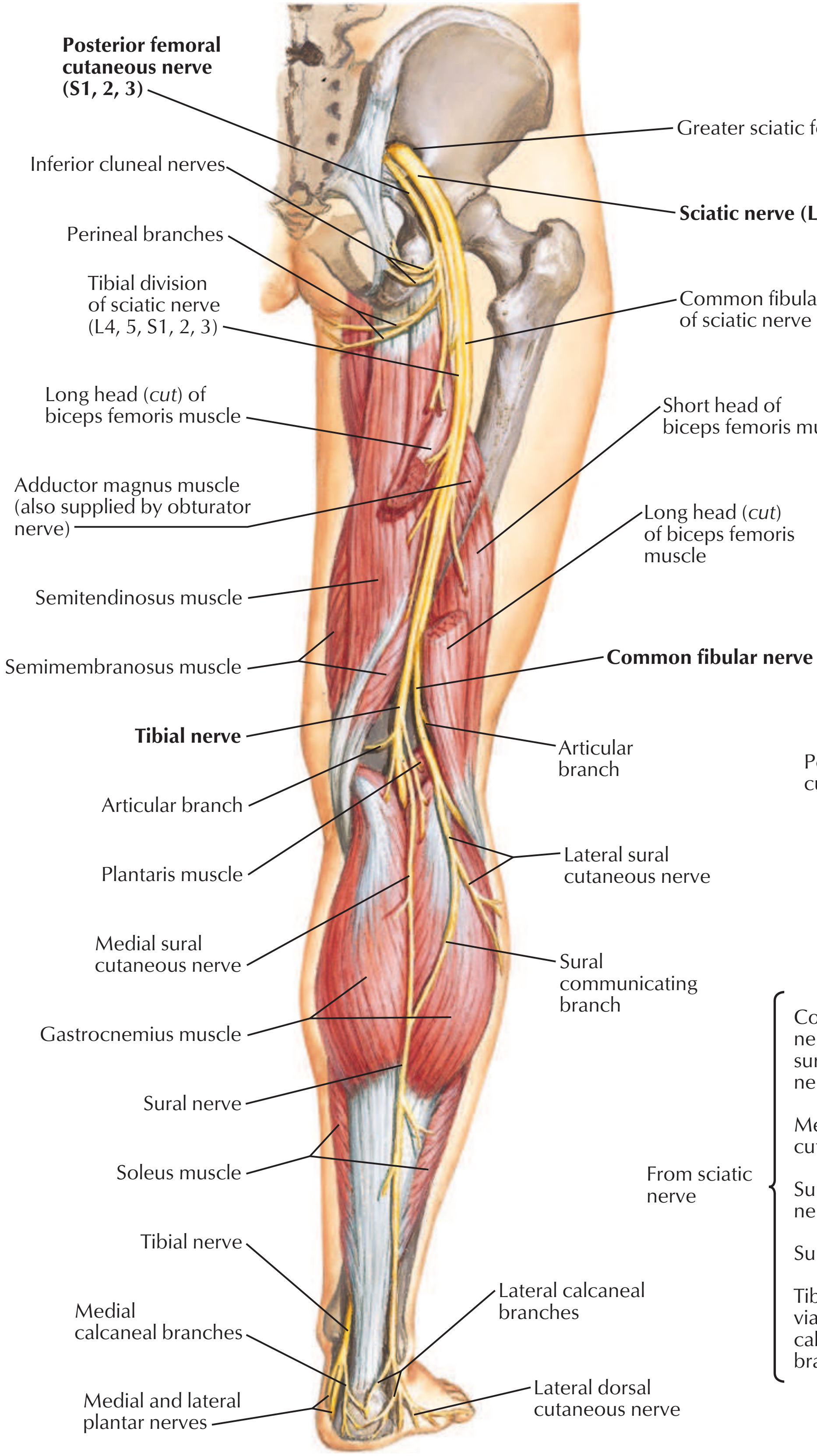
See also Plate 491


Iliohypogastric nerve
Ilioinguinal nerve
Genitofemoral nerve
Lateral femoral cutaneous nerve
Femoral nerve
Obturator nerve (L2, 3, 4)
Posterior branch
Articular branch
Anterior branch
Posterior branch
Cutaneous branch
Articular branch
Adductor hiatus
L1
L2
L3
L4
Anterior rami forming lumbar plexus
Lumbosacral trunk
Obturator externus muscle
Adductor brevis muscle
Adductor longus muscle (*cut*)
Adductor magnus muscle (ischiocondylar, or "hamstrings," part supplied by sciatic [tibial] nerve)
Gracilis muscle
Cutaneous innervation

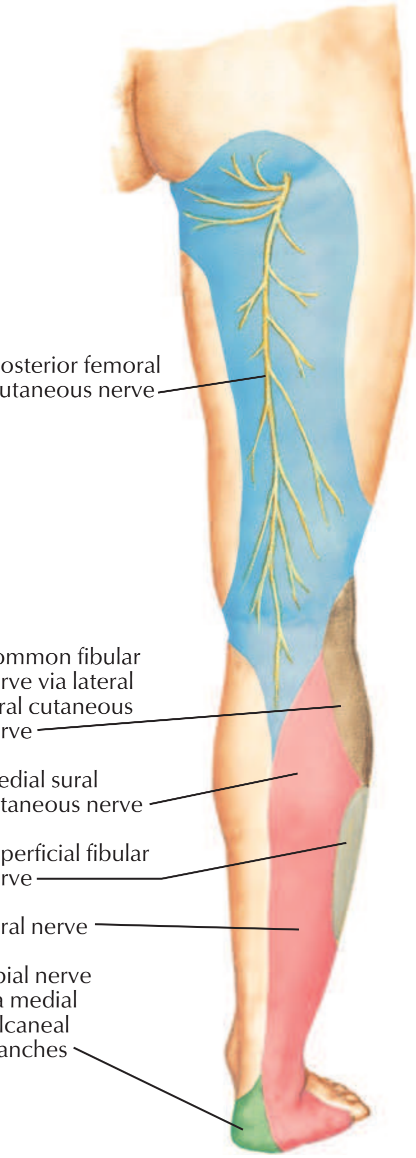
Note: Only muscles innervated by obturator nerve shown

Sciatic Nerve and Posterior Femoral Cutaneous Nerve

See also Plate 492

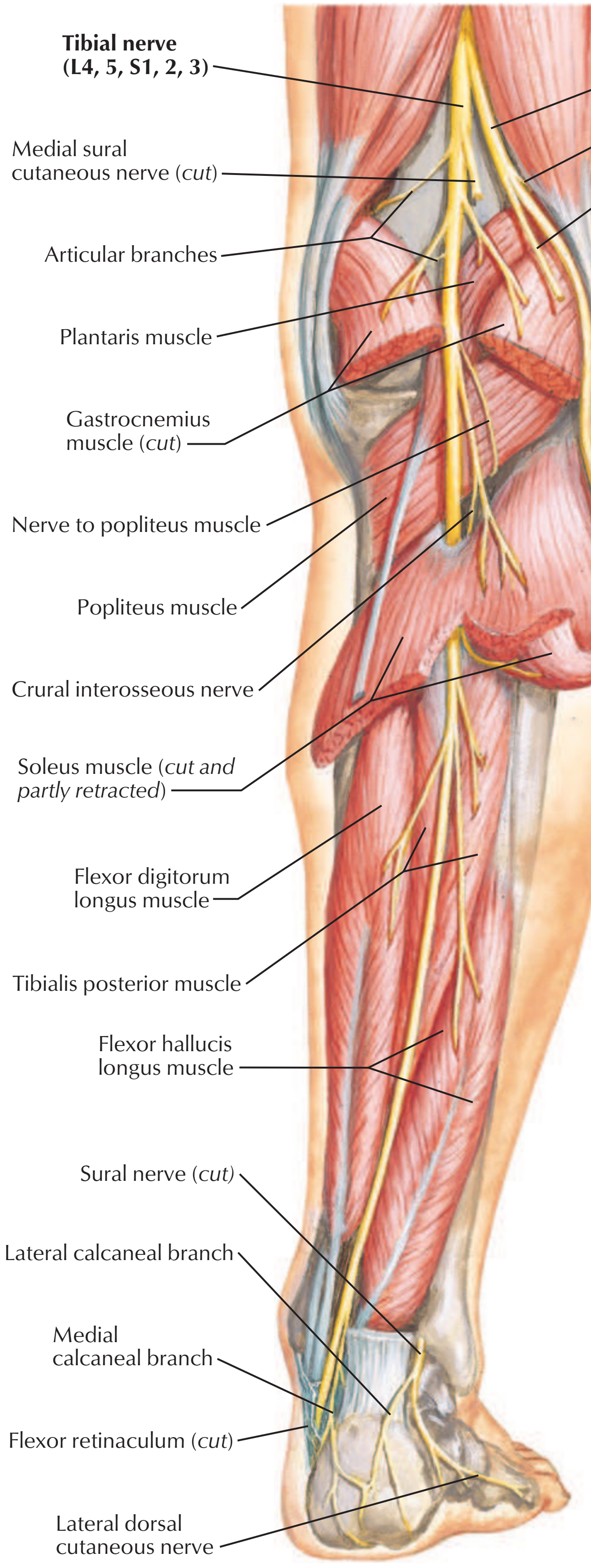

Posterior femoral cutaneous nerve (S1, 2, 3)
Inferior cluneal nerves
Perineal branches
Tibial division of sciatic nerve (L4, 5, S1, 2, 3)
Long head (*cut*) of biceps femoris muscle
Adductor magnus muscle (also supplied by obturator nerve)
Semitendinosus muscle
Semimembranosus muscle
Tibial nerve
Articular branch
Plantaris muscle
Medial sural cutaneous nerve
Gastrocnemius muscle
Sural nerve
Soleus muscle
Tibial nerve
Medial calcaneal branches
Medial and lateral plantar nerves
Greater sciatic foramen
Sciatic nerve (L4, 5, S1, 2, 3)
Common fibular division of sciatic nerve (L4, 5, S1, 2)
Short head of biceps femoris muscle
Long head (*cut*) of biceps femoris muscle
Common fibular nerve
Articular branch
Lateral sural cutaneous nerve
Sural communicating branch
Lateral calcaneal branches
Lateral dorsal cutaneous nerve
F. Netter M.D.

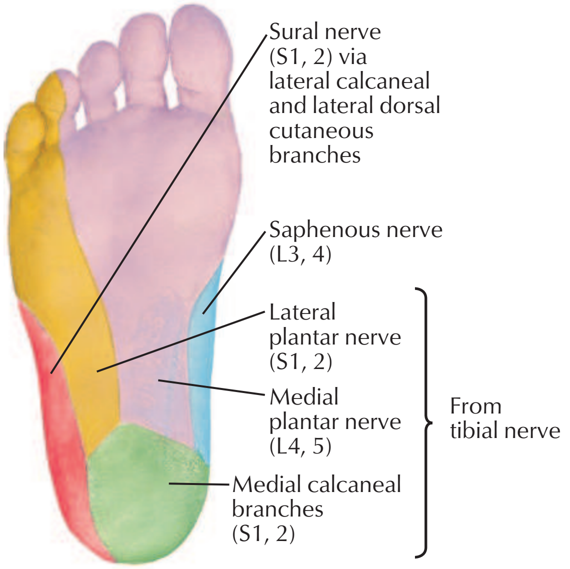
Cutaneous innervation


Posterior femoral cutaneous nerve
From sciatic nerve
Common fibular nerve via lateral sural cutaneous nerve
Medial sural cutaneous nerve
Superficial fibular nerve
Sural nerve
Tibial nerve via medial calcaneal branches

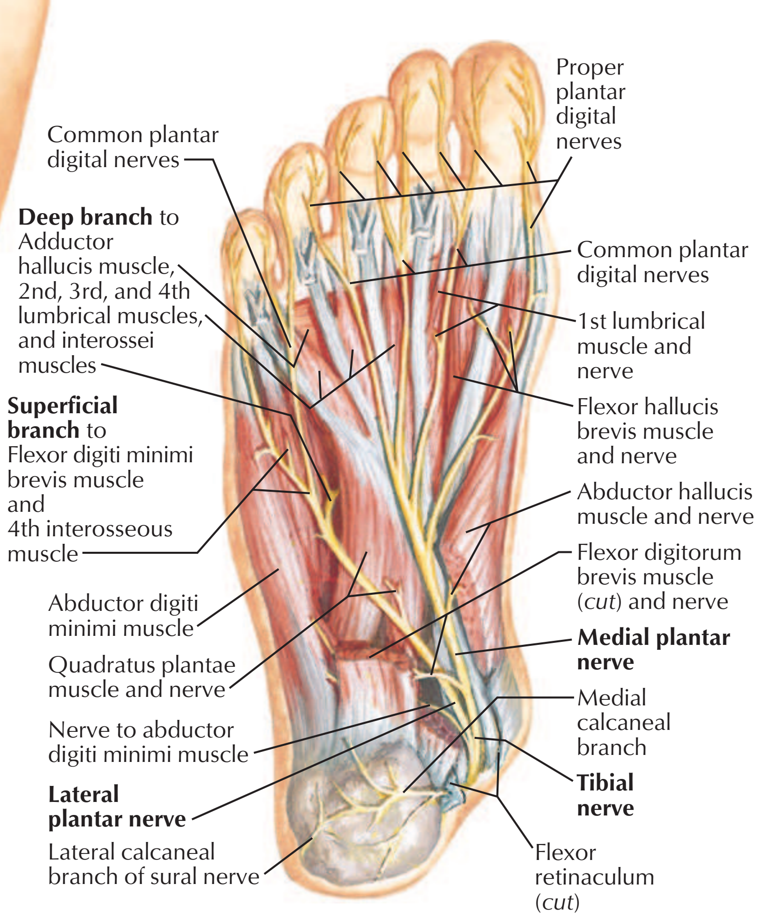
Tibial Nerve

See also Plates 507, 524, 525

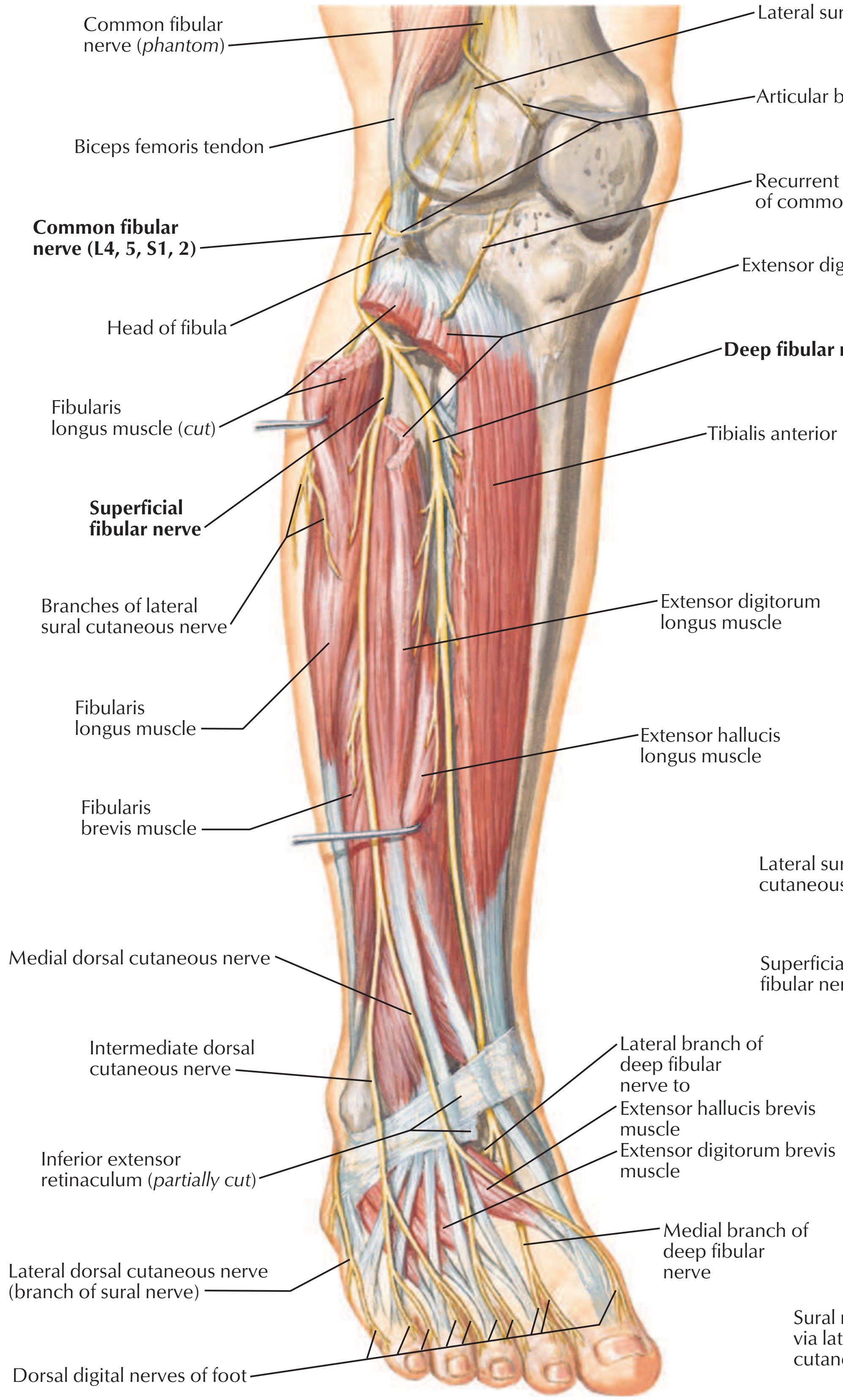

Tibial nerve (L4, 5, S1, 2, 3)
Common fibular nerve
Articular branch
Lateral sural cutaneous nerve (cut)
Medial sural cutaneous nerve (cut)
Articular branches
Plantaris muscle
Gastrocnemius muscle (cut)
Nerve to popliteus muscle
Popliteus muscle
Crural interosseous nerve
Soleus muscle (cut and partly retracted)
Flexor digitorum longus muscle
Tibialis posterior muscle
Flexor hallucis longus muscle
Sural nerve (cut)
Lateral calcaneal branch
Medial calcaneal branch
Flexor retinaculum (cut)
Lateral dorsal cutaneous nerve


Sural nerve (S1, 2) via lateral calcaneal and lateral dorsal cutaneous branches
Saphenous nerve (L3, 4)
Lateral plantar nerve (S1, 2)
Medial plantar nerve (L4, 5)
Medial calcaneal branches (S1, 2)
From tibial nerve

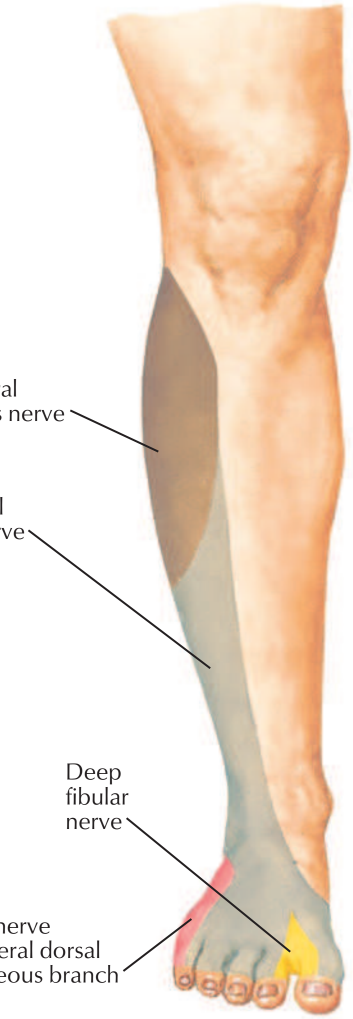
Cutaneous innervation of plantar region


Proper plantar digital nerves
Common plantar digital nerves
Deep branch to Adductor hallucis muscle, 2nd, 3rd, and 4th lumbrical muscles, and interossei muscles
Superficial branch to Flexor digiti minimi brevis muscle and 4th interosseous muscle
Abductor digiti minimi muscle
Quadratus plantae muscle and nerve
Nerve to abductor digiti minimi muscle
Lateral plantar nerve
Lateral calcaneal branch of sural nerve
Common plantar digital nerves
1st lumbrical muscle and nerve
Flexor hallucis brevis muscle and nerve
Abductor hallucis muscle and nerve
Flexor digitorum brevis muscle (cut) and nerve
Medial plantar nerve
Medial calcaneal branch
Tibial nerve
Flexor retinaculum (cut)

See also Plates 510, 512

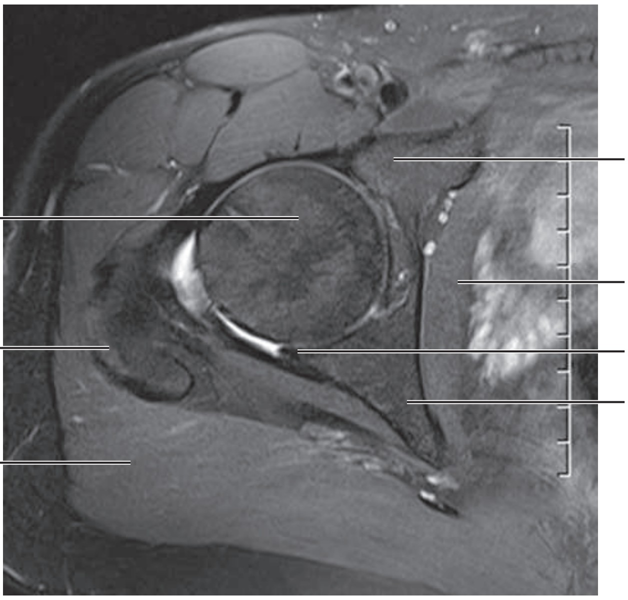

Common fibular nerve (*phantom*)
Lateral sural cutaneous nerve (*phantom*)
Articular branch
Biceps femoris tendon
Recurrent articular branch of common fibular nerve
Common fibular nerve (L4, 5, S1, 2)
Extensor digitorum longus muscle (*cut*)
Head of fibula
Deep fibular nerve
Fibularis longus muscle (*cut*)
Tibialis anterior muscle
Superficial fibular nerve
Branches of lateral sural cutaneous nerve
Extensor digitorum longus muscle
Fibularis longus muscle
Extensor hallucis longus muscle
Fibularis brevis muscle
Medial dorsal cutaneous nerve
Intermediate dorsal cutaneous nerve
Lateral branch of deep fibular nerve to
Extensor hallucis brevis muscle
Extensor digitorum brevis muscle
Inferior extensor retinaculum (*partially cut*)
Medial branch of deep fibular nerve
Lateral dorsal cutaneous nerve (branch of sural nerve)
Dorsal digital nerves of foot

Cutaneous innervation

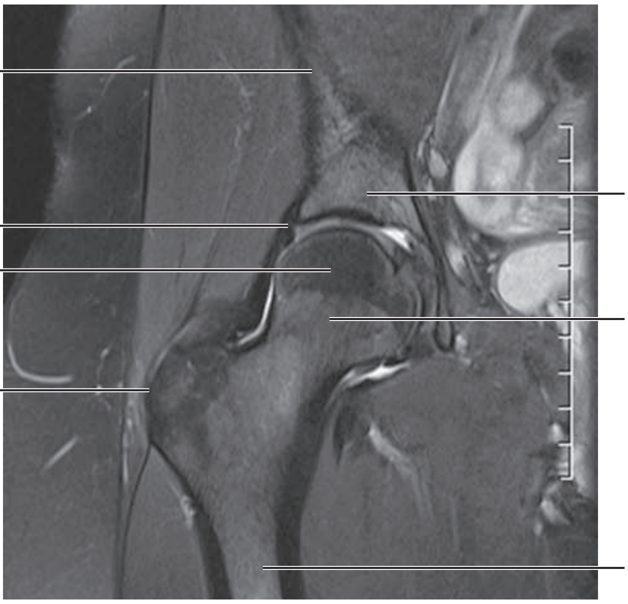

Lateral sural cutaneous nerve
Superficial fibular nerve
Deep fibular nerve
Sural nerve via lateral dorsal cutaneous branch

See also Plates 334, 400, 495

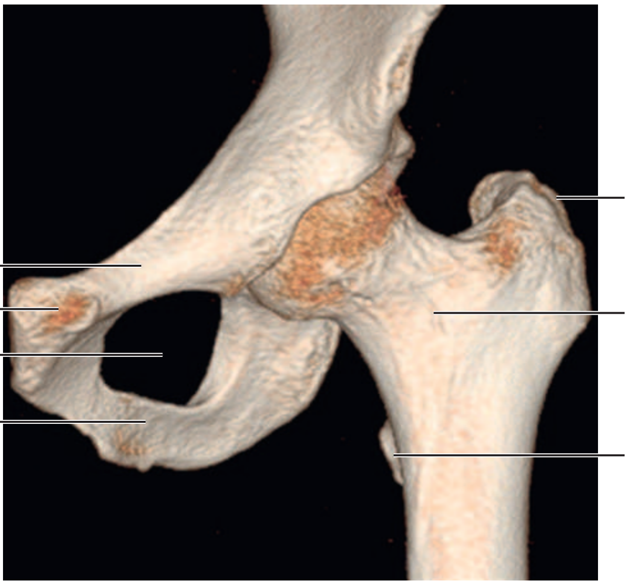
Axial T2-Weighted MRI


Acetabular labrum
Head of femur
Obturator internus muscle
Greater trochanter
Posterior labrum
Acetabular labrum
Gluteus maximus muscle

Coronal T2-Weighted MRI

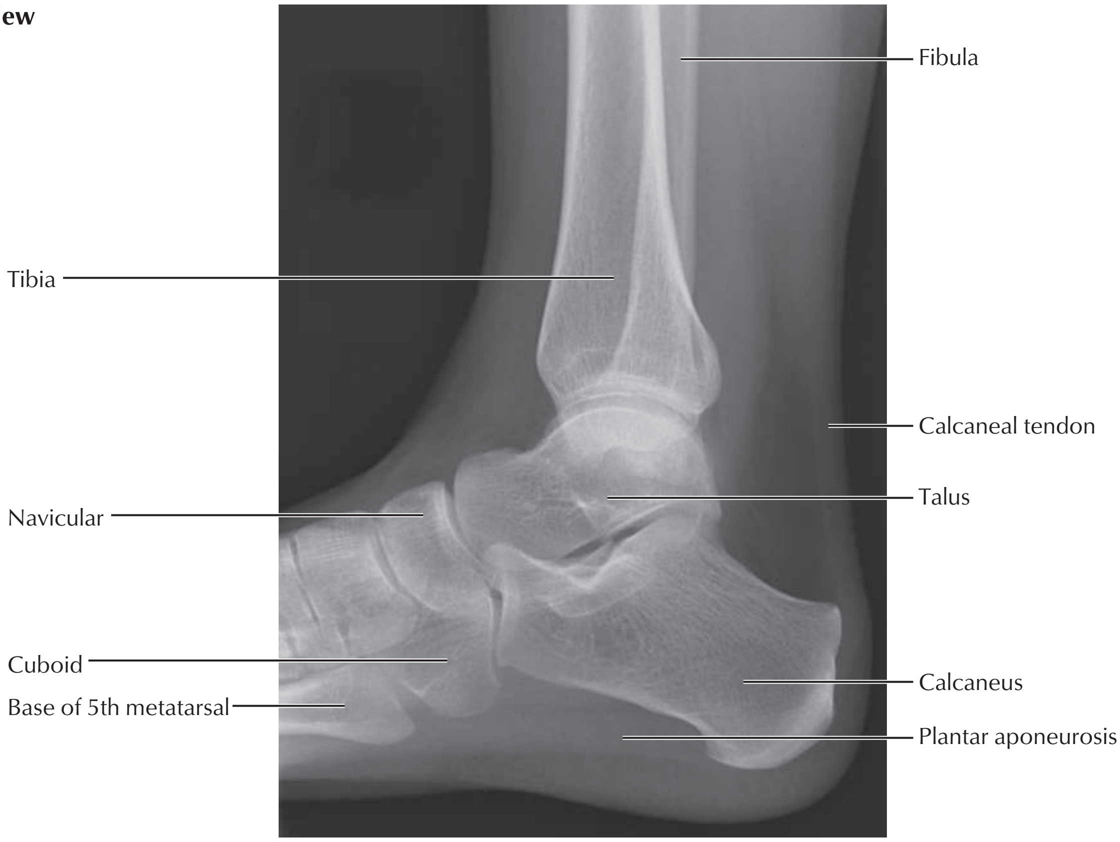

Ala of ilium
Acetabular labrum
Acetabular labrum
Head of femur
Neck of femur
Greater trochanter
Femur

3D CT of Hip

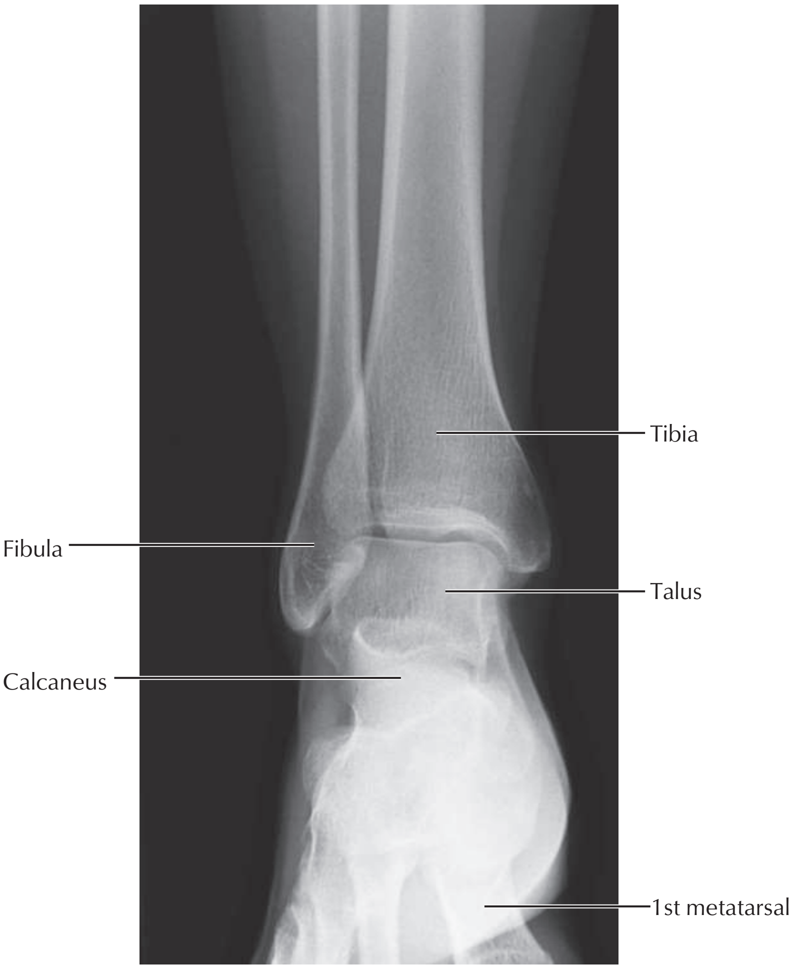

Greater trochanter
Superior pubic ramus
Pubic tubercle
Neck of femur
Obturator foramen
Inferior pubic ramus
Lesser trochanter

See also Plates 510, 517, 518

Lateral view


Fibula
Tibia
Calcaneal tendon
Talus
Navicular
Cuboid
Base of 5th metatarsal
Calcaneus
Plantar aponeurosis

Anterior view


Tibia
Fibula
Talus
Calcaneus
1st metatarsal

Structures with High* Clinical Significance

ANATOMICAL STRUCTURES	CLINICAL IMPORTANCE	PLATE NUMBERS
SKELETAL SYSTEM		
Neck of femur	Common fracture in elderly persons; can lead to avascular necrosis of femoral head	478, 479, 495
Shaft of femur	The midshaft is a common fracture site in high-energy trauma (motor vehicle accidents)	479
Hip joint	Potential for vascular necrosis of femoral head in hip dislocations or fractures	477, 495
Medial (tibial) collateral ligament, anterior cruciate ligament, and medial meniscus	"Unhappy triad" from blow to lateral aspect of joint in extension; damage to medial collateral and anterior cruciate ligaments and medial meniscus	498, 499, 500
Tibia and fibula	High-energy fractures of shaft (boot-top skiing fracture) from falling forward at high speed	504
First metatarsophalangeal joint	Joint misalignment leading to hallux valgus (bunion), often result of wearing shoes that are too narrow; also, strong genetic component	515
Calcaneus	Most common tarsal bone fracture, usually caused by landing forcefully on heel after falling from height	517
Ankle joint	Most sprains are inversion injuries that occur when foot is plantarflexed; places stress on lateral ligaments of ankle	518
MUSCULAR SYSTEM		
Gracilis, adductor longus, adductor brevis, adductor magnus	Excessive stretching or tearing of thigh adductor muscles is common in sports that require repeated sprints or quick changes in direction (e.g., soccer, hockey)	482, 483
Patellar ligament	Striking patellar ligament with reflex hammer elicits patellar (knee jerk) reflex to test L3 to L4 spinal cord levels (innervation of quadriceps femoris muscle by femoral nerve)	482, 498
Iliotibial tract (band)	Commonly injured in runners as iliotibial tract rubs across lateral femoral epicondyle	484, 497
Semitendinosus, semimembranosus, biceps femoris (long head)	Excessive stretching or tearing of hamstring muscles occurs most often during high-speed running or activities with high kicks	485
Piriformis muscle	Piriformis muscle strain or structural variations (e.g., split piriformis muscle) may produce compression of sciatic nerve	492
Gluteus medius and minimus muscles (superior gluteal nerve)	Paralysis of these muscles results in contralateral pelvic dip due to weakened hip abduction when standing on affected limb (Trendelenburg sign or gait)	493
Calcaneal (Achilles) tendon	Inflammation results from repetitive stress on tendon, often from running on uneven surfaces; extreme stress may cause tendon to rupture	507, 508, 518
Calcaneal (Achilles) tendon	Striking calcaneal tendon with reflex hammer elicits ankle (ankle jerk) reflex to test S1 to S2 spinal cord levels (innervation of superficial calf muscles by tibial nerve)	507, 508, 531
Anterior compartment of leg	Exertional compartment syndromes (midtibial pain; shin splints) usually result from excessive training (swelling, periostitis, or stress fractures occur because of tight fascial boundaries of muscle compartments)	514
Plantar aponeurosis	Inflammation results from increased tension, weight, or overuse, causing heel and foot pain (plantar fasciitis; heel spur syndrome)	523

ANATOMICAL STRUCTURES	CLINICAL IMPORTANCE	PLATE NUMBERS
NERVOUS SYSTEM		
Sural nerve	Nerve is commonly biopsied for peripheral neuropathies and commonly used as donor graft in neurotization procedure	474, 531
Common fibular nerve	Injury to this nerve from blunt trauma or compression by leg cast weakens dorsiflexion and results in foot drop	529, 531, 533
Obturator nerve	Nerve is blocked or transected for adductor muscle spasticity in cerebral palsy; may be injured during pelvic fractures or pelvic surgical procedures such as lymphadenectomy	530
Femoral nerve	Can be compressed from femoral hematoma and can be anesthetized for procedures of the lower limb	488, 490, 529
Saphenous nerve	Can be anesthetized in the adductor canal to provide pain relief after knee replacement	473, 490, 529
CARDIOVASCULAR SYSTEM		
Deep veins of leg	Deep venous thrombosis of deep leg veins is due to venous stasis, vessel injury, and/or coagulation disorders; can lead to thrombus formation and thromboemboli	513
Great saphenous vein	Often used as coronary artery bypass grafts	473
Superficial veins	Varicose veins (dilated tortuous superficial veins connected by perforating veins to deeper veins with incompetent venous valves)	473, 513
Femoral artery in femoral triangle; popliteal artery in deep popliteal region of knee; dorsalis pedis artery on dorsum of foot; posterior tibial artery in tarsal tunnel posterior to medial malleolus	Lower limb pulse points	490, 503, 508, 513
Major arteries of lower limb (femoral artery, popliteal artery, tibial artery, and fibular artery)	Peripheral arterial disease due to atherosclerosis may occur in major arteries of lower limb, resulting in reduced blood flow; patients experience claudication (cramping pain in thigh or calf), especially upon exertion	503
LYMPHATIC SYSTEM		
Superficial inguinal nodes	Superficial inguinal nodes drain the lower limb, gluteal region, lower abdominal region, and perineum; are palpable when enlarged	475
Lymph vessels	Lymphedema (stasis of lymph flow in lymph vessels obstructed by inflammation, fibrosis, tumor, or abnormally small diameter)	475

*Selections were based largely on clinical data as well as commonly covered clinical correlations in gross anatomy courses.

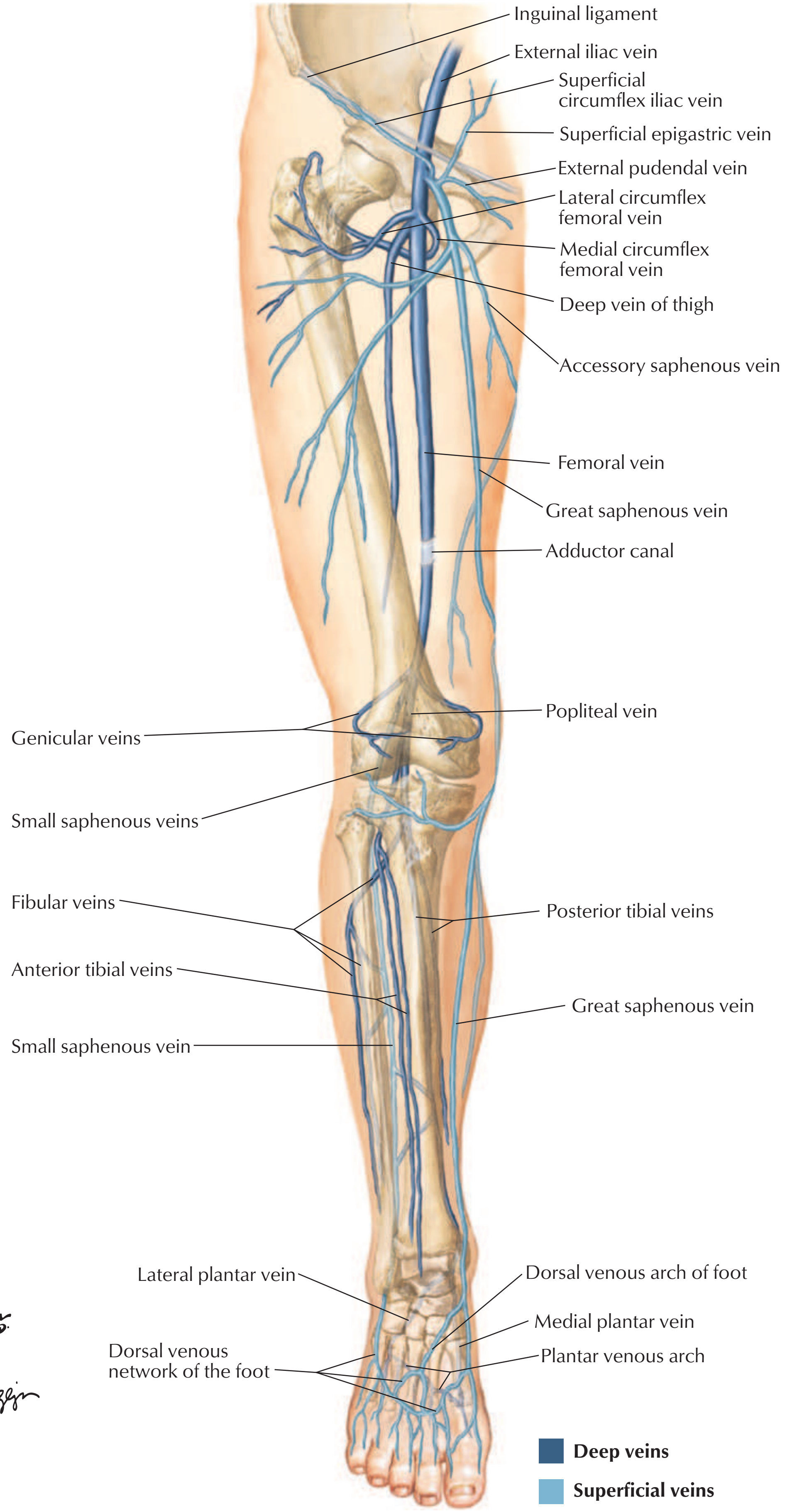
MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Abductor digiti minimi	Foot	Medial and lateral tubercles of tuberosity of calcaneus, plantar aponeurosis, and intermuscular septum	Lateral side of base of proximal phalanx of 5th digit	Lateral plantar nerve	Mediolateral plantar artery, plantar metatarsal and plantar digital arteries to 5th digit	Abducts and flexes 5th digit
Abductor hallucis	Foot	Medial tubercle of tuberosity of calcaneus, flexor retinaculum, and plantar aponeurosis	Medial side of base of proximal phalanx of 1st digit	Medial plantar nerve	Medial plantar and 1st plantar metatarsal arteries	Abducts and flexes 1st digit
Adductor brevis	Medial thigh	Body and inferior pubic ramus	Pectineal line and proximal part of linea aspera of femur	Obturator nerve	Profunda femoris, medial circumflex femoral, and obturator arteries	Adducts thigh at hip, weak hip flexor
Adductor hallucis	Foot	*Oblique head:* bases of 2nd through 4th metatarsals *Transverse head:* ligaments of metatarsophalangeal joints of digits 3–5	Tendons of both heads lateral to side of base of proximal phalanx of 1st digit	Deep branch of lateral plantar nerve	Medial and lateral plantar arteries and plantar arch, plantar metatarsal arteries	Adducts 1st digit, maintains transverse arch of foot
Adductor longus	Medial thigh	Body of pubis inferior to pubic crest	Middle third of linea aspera of femur	Obturator nerve (anterior division)	Profunda femoris and medial circumflex femoral arteries	Adducts thigh at hip
Adductor magnus	Medial thigh	Inferior pubic ramus, ramus of ischium *Hamstring part*: ischial tuberosity	Gluteal tuberosity, linea aspera, medial supracondylar line *Hamstring part:* adductor tubercle of femur	*Adductor part:* obturator nerve *Hamstring part:* sciatic nerve (tibial division)	Femoral, profunda femoris, and obturator arteries	*Adductor part:* adducts and flexes thigh *Hamstring part:* extends thigh
Articularis genus	Anterior thigh	Distal femur on anterior surface	Suprapatellar bursa	Femoral nerve	Femoral artery	Pulls suprapatellar bursa superiorly with extension of knee
Biceps femoris	Posterior thigh	*Long head:* ischial tuberosity *Short head:* Linea aspera and lateral supracondylar line of femur	Lateral side of head of fibula	*Long head:* sciatic nerve (tibial division) (L5–S2) *Short head:* sciatic nerve (common fibular division)	Perforating branches of profunda femoris, inferior gluteal, and medial circumflex femoral arteries	Flexes and laterally rotates leg, extends thigh at hip
Dorsal interossei (four muscles)	Foot	Adjacent sides of 1st through 5th metatarsals	*1st:* medial side of proximal phalanx of 2nd digit *2nd through 4th*: lateral sides of digits 2–4	Lateral plantar nerve	Arcuate artery, dorsal and plantar metatarsal arteries	Abduct 2nd through 4th digits of foot, flex metatarsophalangeal joints, and extend phalangeal bones
Extensor digitorum brevis and extensor hallucis brevis	Foot	Superolateral surface of calcaneus, lateral talocalcaneal ligament, deep surface of inferior extensor retinaculum	First tendon into dorsal surface of base of proximal phalanx of great toe; other three tendons into lateral sides of tendons of extensor digitorum longus to digits 2–4	Deep fibular nerve	Dorsalis pedis, lateral tarsal, arcuate, and fibular arteries	Aids extensor digitorum longus in extending of 4 medial digits at metatarsophalangeal and interphalangeal joints
Extensor digitorum longus	Anterior leg	Lateral condyle of tibia, proximal 3/4 of anterior surface of interosseous membrane and fibula	Middle and distal phalangeal bones of lateral four digits	Deep fibular nerve	Anterior tibial artery	Extends lateral four digits and dorsiflexes foot at ankle
Extensor hallucis longus	Anterior leg	Middle part of anterior surface of fibula and interosseous membrane	Dorsal aspect of base of distal phalanx of great toe	Deep fibular nerve	Anterior tibial artery	Extends great toe, dorsiflexes foot at ankle

Variations in spinal nerve contributions to the innervation of muscles, their arterial supply, their attachments, and their actions are common themes in human anatomy. Therefore, expect differences between texts and realize that anatomical variation is normal.

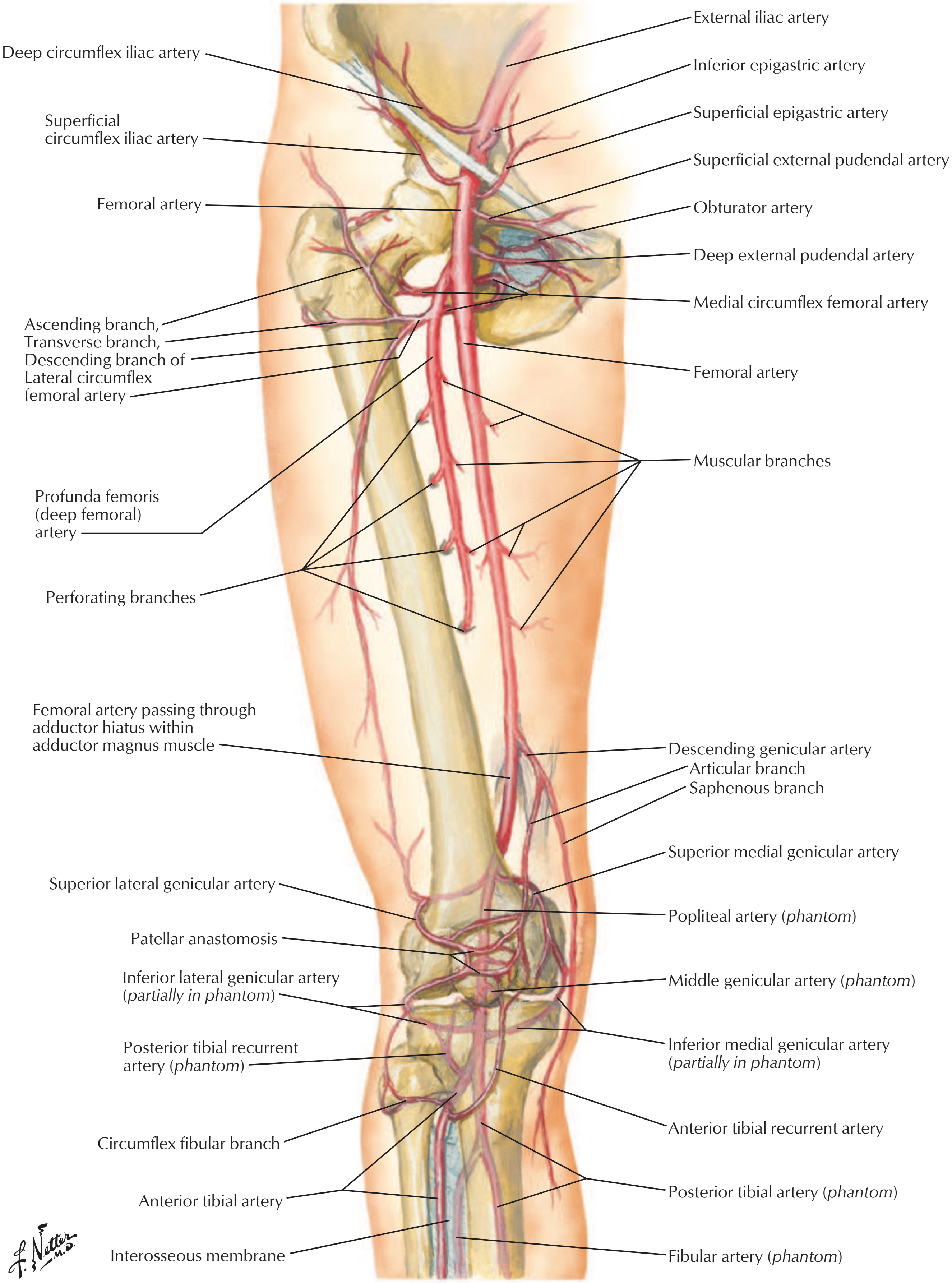
MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Fibularis brevis	Lateral leg	Distal 2/3 of lateral surface of fibula	Dorsal surface of tuberosity on lateral side of 5th metatarsal	Superficial fibular nerve	Anterior tibial and fibular arteries	Everts foot and weakly plantarflexes foot at ankle
Fibularis longus	Lateral leg	Head and proximal 2/3 of lateral fibula	Plantar base of 1st metatarsal and medial cuneiform bone	Superficial fibular nerve	Anterior tibial and fibular arteries	Everts foot and weakly plantarflexes foot at ankle
Fibularis tertius	Anterior leg	Distal third of anterior surface of fibula and interosseous membrane	Dorsum of base of 5th metatarsal	Deep fibular nerve	Anterior tibial artery	Dorsiflexes foot at ankle and aids in eversion of foot
Flexor digiti minimi brevis	Foot	Base of 5th metatarsal	Lateral base of proximal phalanx of 5th digit	Superficial branch of lateral plantar nerve	Lateral plantar artery, plantar digital artery to 5th digit, arcuate artery	Flexes proximal phalanx of 5th digit
Flexor digitorum brevis	Foot	Medial tubercle of tuberosity of calcaneus, plantar aponeurosis, and intermuscular septum	Both sides of middle phalangeal bones of lateral four digits	Medial plantar nerve	Medial and lateral plantar arteries and plantar arch, plantar metatarsal and plantar digital arteries	Flexes 2nd through 5th digits
Flexor digitorum longus	Posterior leg	Medial part of posterior tibia inferior to soleal line	Plantar bases of distal phalangeal bones of lateral four digits	Tibial nerve	Posterior tibial artery	Flexes lateral four digits and plantarflexes foot at ankle; supports longitudinal arches of foot
Flexor hallucis brevis	Foot	Plantar surfaces of cuboid bone and lateral cuneiform bone	Both sides of base of proximal phalanx of 1st digit	Medial plantar nerve	Medial plantar artery, 1st plantar metatarsal artery	Flexes proximal phalanx of 1st digit
Flexor hallucis longus	Posterior leg	Distal 2/3 of posterior fibula and interosseous membrane	Base of distal phalanx of great toe	Tibial nerve	Fibular artery	Flexes all joints of great toe, weakly plantarflexes foot at ankle
Gastrocnemius	Posterior leg	*Lateral head:* lateral aspect of lateral condyle of femur *Medial head:* popliteal surface above medial condyle of femur	Posterior aspect of calcaneus via calcaneal tendon	Tibial nerve	Popliteal and posterior tibial arteries	Plantarflexes foot at ankle joint, assists in flexion of knee joint
Gluteus maximus	Gluteal region	Ilium posterior to posterior gluteal line, dorsal surface of sacrum and coccyx, sacrotuberous ligament	Most fibers end in iliotibial tract that inserts into lateral condyle of tibia; some fibers insert into gluteal tuberosity of femur	Inferior gluteal nerve	Inferior gluteal arteries mainly, and superior gluteal arteries occasionally	Extends flexed thigh, assists in lateral rotation, and abducts thigh
Gluteus medius	Gluteal region	Lateral surface of ilium between anterior and posterior gluteal lines	Lateral surface of greater trochanter of femur	Superior gluteal nerve	Superior gluteal artery	Abducts and medially rotates thigh at hips; steadies pelvis on leg when opposite leg is raised
Gluteus minimus	Gluteal region	Lateral surface of ilium between anterior and inferior gluteal lines	Anterior surface of greater trochanter of femur	Superior gluteal nerve	Main trunk and deep branch of superior gluteal artery	Abducts and medially rotates thigh at hips; steadies pelvis on leg when opposite leg is raised
Gracilis	Medial thigh	Body and inferior ramus of pubis	Superior part of medial surface of tibia	Obturator nerve	Profunda femoris artery, medial circumflex femoral artery	Adducts thigh, flexes and medially rotates leg
Iliacus (iliopsoas)	Anterior thigh	Superior 2/3 of iliac fossa, iliac crest, ala of sacrum, anterior sacroiliac ligaments	Lesser trochanter of femur and shaft inferior to it, to psoas major tendon	Femoral nerve	Iliac branches of iliolumbar artery	Flexes thigh at hips and stabilizes hip joint, acts with psoas major
Inferior gemellus	Gluteal region	Ischial tuberosity	Medial surface of greater trochanter of femur	Nerve to quadratus femoris muscle	Medial circumflex femoral artery	Laterally rotates extended thigh and abducts flexed thigh

MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Lumbricals	Foot	Tendons of flexor digitorum longus	Medial side of dorsal digital expansions of lateral four digits	*Medial one:* medial plantar nerve *Lateral three*: lateral plantar nerve	Lateral plantar artery and plantar metatarsal arteries	Flexes proximal phalangeal bones at metatarsophalangeal joint, extends phalangeal bones at proximal interphalangeal and distal interphalangeal joints
Obturator externus	Medial thigh	Margins of obturator foramen, obturator membrane	Trochanteric fossa of femur	Obturator nerve	Medial circumflex femoral artery, obturator artery	Laterally rotates thigh, stabilizes head of femur in acetabulum
Obturator internus	Gluteal region	Pelvic surface of obturator membrane and surrounding bone	Medial surface of greater trochanter of femur	Nerve to obturator internus muscle	Internal pudendal and obturator arteries	Laterally rotates extended thigh, abducts flexed thigh at hip
Pectineus	Medial thigh	Superior ramus of pubis	Pectineal line of femur	Femoral nerve and sometimes obturator nerve	Medial circumflex femoral artery, obturator artery	Adducts and flexes thigh at hip
Piriformis	Gluteal region	Anterior surface of sacral segments 2–4, sacrotuberous ligament (inconstant)	Superior border of greater trochanter of femur	Ventral rami of L5, S1, S2	Superior and inferior gluteal arteries, internal pudendal artery	Laterally rotates extended thigh, abducts flexed thigh at hip
Plantar interossei (three muscles)	Foot	Bases and medial sides of 3rd through 5th metatarsals	Medial sides of bases of proximal phalangeal bones of 3rd through 5th digits	Lateral plantar nerve	Lateral plantar artery and plantar arch, plantar metatarsal and plantar digital arteries	Adduct digits (3-5) and flex metatarsophalangeal joint and extend phalangeal bones
Plantaris	Posterior leg	Inferior end of lateral supracondylar line of femur and oblique popliteal ligament	Posterior aspect of calcaneus via calcaneal tendon	Tibial nerve	Popliteal artery	Weakly assists gastrocnemius
Popliteus	Posterior leg	Lateral aspect of lateral condyle of femur, lateral meniscus	Posterior tibia superior to soleal line	Tibial nerve (L4–S1)	Inferior medial and lateral genicular arteries	Weakly flexes knee and unlocks it by rotating femur on fixed tibia
Psoas major (iliopsoas)	Anterior thigh	Transverse processes of lumbar vertebrae, sides of bodies of T12–L5 vertebrae, intervening intervertebral discs	Lesser trochanter of femur	Anterior rami of first three lumbar nerves	Lumbar branches of iliolumbar artery	Acting superiorly with iliacus, flexes hip; acting inferiorly, flexes vertebral column laterally; used to balance trunk in sitting position; acting inferiorly with iliacus, flexes trunk
Quadratus femoris	Gluteal region	Lateral margin of ischial tuberosity	Quadrate tubercle on intertrochanteric crest of femur	Nerve to quadratus femoris muscle	Medial circumflex femoral artery	Laterally rotates thigh at hip
Quadratus plantae	Foot	Medial and lateral sides of plantar surface of calcaneus	Posterolateral edge of flexor digitorum longus tendon	Lateral plantar nerve	Medial and lateral plantar arteries and deep plantar arterial arch	Corrects for oblique pull of flexor digitorum longus tendon, thus assisting in flexion of digits of foot
Rectus femoris (quadriceps)	Anterior thigh	Anterior inferior iliac spine and ilium superior to acetabulum	Base of patella and to tibial tuberosity via patellar ligament	Femoral nerve	Profunda femoris and lateral circumflex femoral arteries	Extends leg at knee joint and flexes thigh at hip joint
Sartorius	Anterior thigh	Anterior superior iliac spine and superior part of notch below it	Superior part of medial surface of tibia	Femoral nerve	Femoral artery	Abducts, laterally rotates, and flexes thigh; flexes knee joint
Semimembranosus	Posterior thigh	Ischial tuberosity	Posterior part of medial condyle of tibia	Sciatic nerve (tibial division)	Perforating branch of profunda femoris and medial circumflex femoral arteries	Flexes leg, extends thigh

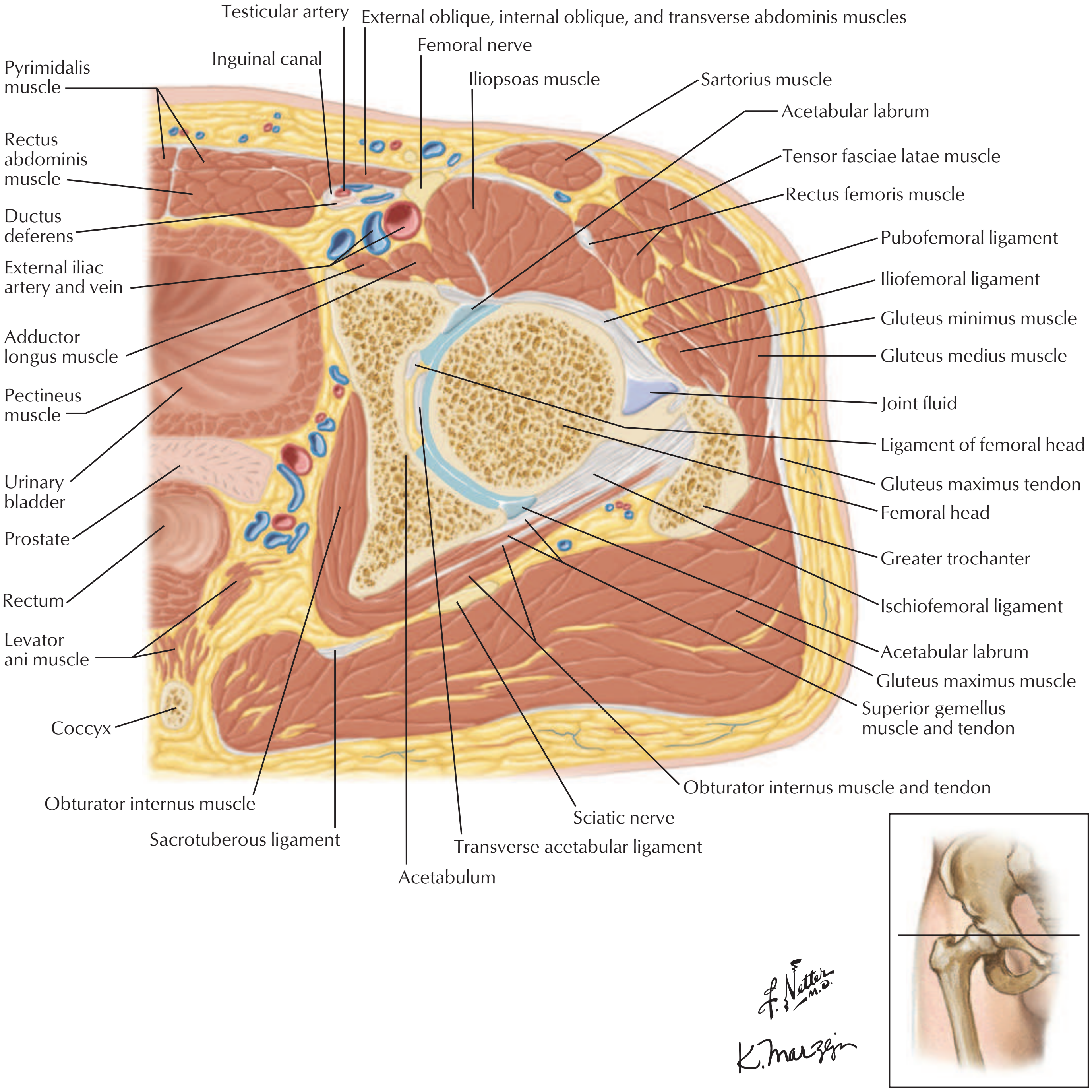
MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT (ORIGIN)	DISTAL ATTACHMENT (INSERTION)	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Semitendinosus	Posterior thigh	Ischial tuberosity	Superior part of medial surface of tibia	Sciatic nerve (tibial division)	Perforating branch of profunda femoris and medial circumflex femoral arteries	Flexes leg, extends thigh
Soleus	Posterior leg	Posterior aspect of head of fibula, proximal 1/4 of posterior surface of fibula, soleal line of tibia	Posterior aspect of calcaneus via calcaneal tendon	Tibial nerve	Popliteal, posterior tibial, and fibular arteries	Plantarflexes foot at ankle, stabilizes leg over foot
Superior gemellus	Gluteal region	Outer surface of ischial spine	Medial surface of greater trochanter of femur	Nerve to obturator internus muscle	Inferior gluteal and internal pudendal arteries	Laterally rotates extended thigh and abducts flexed thigh
Tensor fasciae latae	Gluteal region	Anterior superior iliac spine and anterior part of iliac crest	Iliotibial tract that attaches to lateral condyle of tibia	Superior gluteal nerve	Ascending branch of lateral circumflex femoral artery	Abducts, medially rotates, and flexes thigh at hip; helps to keep knee extended
Tibialis anterior	Anterior leg	Lateral condyle, proximal half of lateral tibia, interosseous membrane	Medial plantar surfaces of medial cuneiform bone and base of 1st metatarsal bone	Deep fibular nerve	Anterior tibial artery	Dorsiflexes foot at ankle and inverts foot
Tibialis posterior	Posterior leg	Posterior tibia below soleal line, interosseous membrane, proximal half of posterior fibula	Tuberosity of navicular bone, all cuneiforms, cuboid, and bases of 2nd through 4th metatarsal bones	Tibial nerve	Fibular artery	Plantarflexes foot at ankle and inverts foot
Vastus intermedius (quadriceps)	Anterior thigh	Anterior and lateral surfaces of body of femur	Base of patella and to tibial tuberosity via patellar ligament	Femoral nerve	Lateral circumflex femoral and profunda femoris arteries	Extends leg at knee joint
Vastus lateralis (quadriceps)	Anterior thigh	Greater trochanter, lateral lip of gluteal tuberosity, lateral lip of linea aspera	Base of patella and to tibial tuberosity via patellar ligament	Femoral nerve	Lateral circumflex femoral and profunda femoris arteries	Extends leg at knee joint
Vastus medialis (quadriceps)	Anterior thigh	Intertrochanteric line, greater trochanter, lateral lip of gluteal tuberosity, and lateral lip of linea aspera	Base of patella and to tibial tuberosity via patellar ligament	Femoral nerve	Femoral and profunda femoris arteries	Extends leg at knee joint

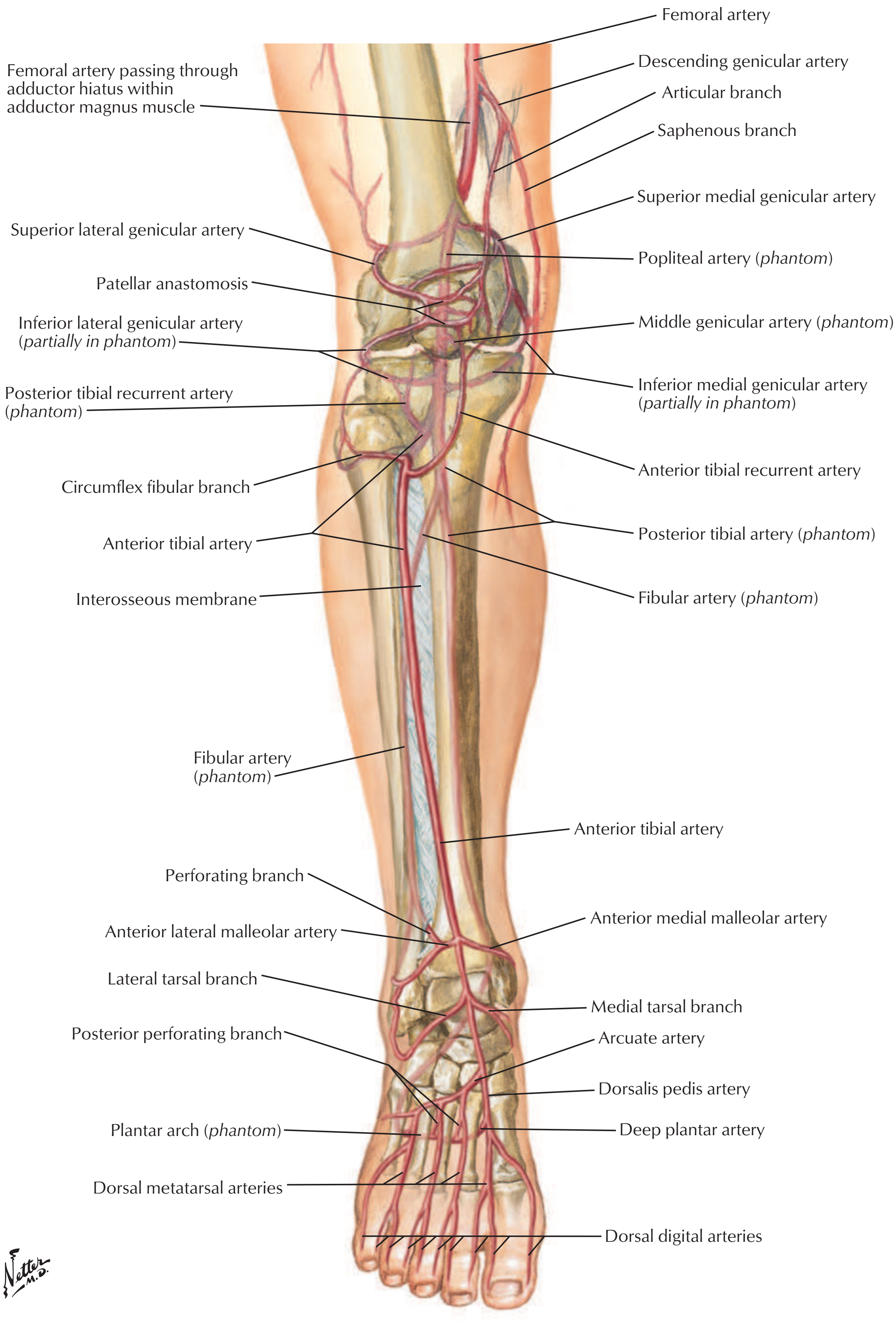

Inguinal ligament
External iliac vein
Superficial circumflex iliac vein
Superficial epigastric vein
External pudendal vein
Lateral circumflex femoral vein
Medial circumflex femoral vein
Deep vein of thigh
Accessory saphenous vein
Femoral vein
Great saphenous vein
Adductor canal
Popliteal vein
Genicular veins
Small saphenous veins
Fibular veins
Posterior tibial veins
Anterior tibial veins
Great saphenous vein
Small saphenous vein
Lateral plantar vein
Dorsal venous arch of foot
Medial plantar vein
Dorsal venous network of the foot
Plantar venous arch

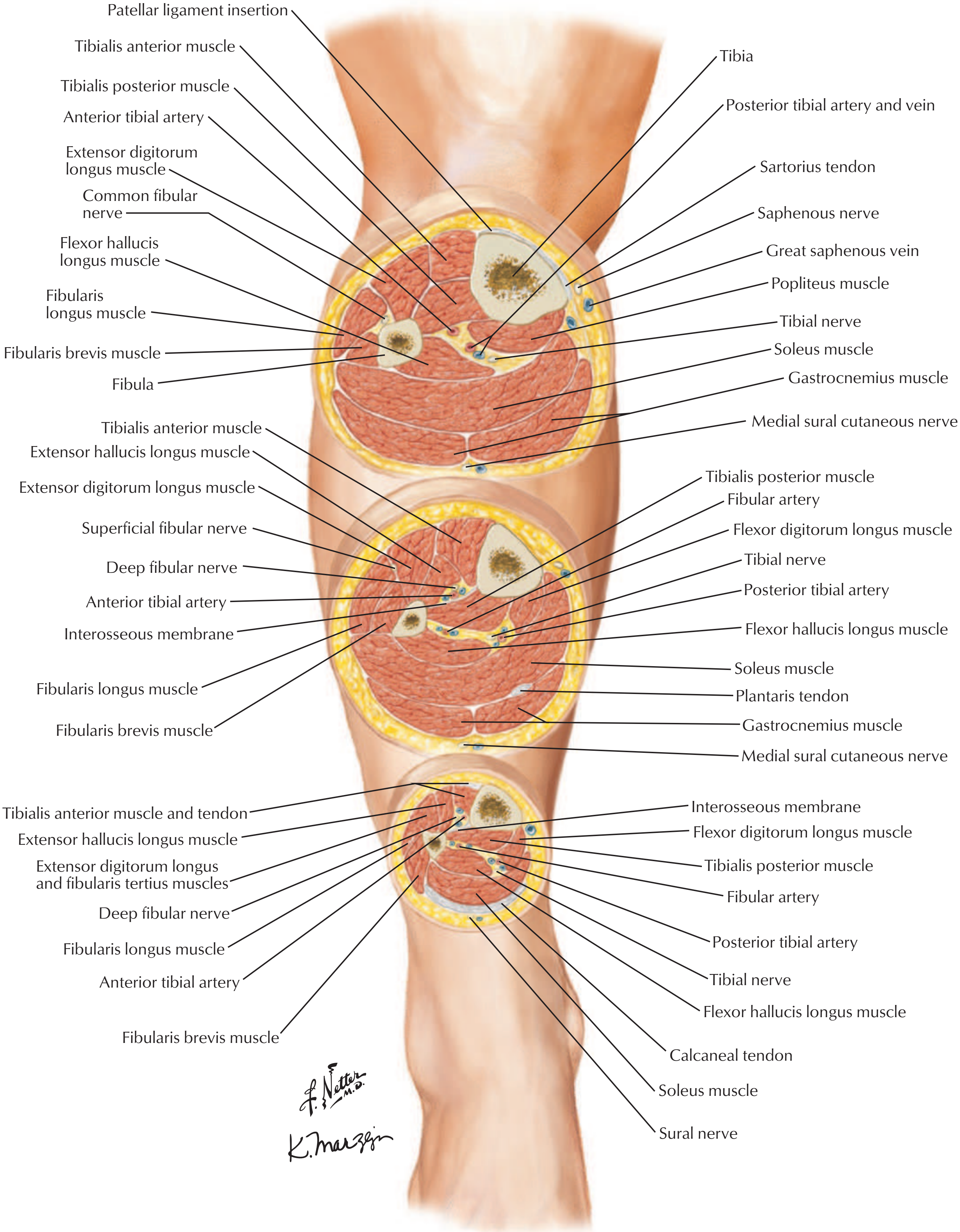
- ■ **Deep veins**
- ■ **Superficial veins**


External iliac artery
Deep circumflex iliac artery
Inferior epigastric artery
Superficial epigastric artery
Superficial circumflex iliac artery
Superficial external pudendal artery
Femoral artery
Obturator artery
Deep external pudendal artery
Medial circumflex femoral artery
Ascending branch,
Transverse branch,
Descending branch of
Lateral circumflex femoral artery
Femoral artery
Muscular branches
Profunda femoris (deep femoral) artery
Perforating branches
Femoral artery passing through adductor hiatus within adductor magnus muscle
Descending genicular artery
Articular branch
Saphenous branch
Superior medial genicular artery
Superior lateral genicular artery
Popliteal artery (*phantom*)
Patellar anastomosis
Inferior lateral genicular artery (*partially in phantom*)
Middle genicular artery (*phantom*)
Inferior medial genicular artery (*partially in phantom*)
Posterior tibial recurrent artery (*phantom*)
Anterior tibial recurrent artery
Circumflex fibular branch
Posterior tibial artery (*phantom*)
Anterior tibial artery
Interosseous membrane
Fibular artery (*phantom*)

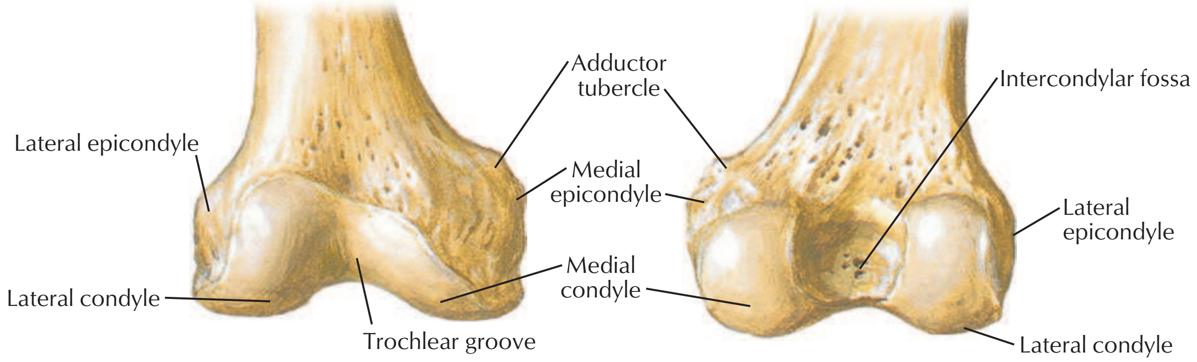
Cross-Sectional Anatomy of Hip: Axial View

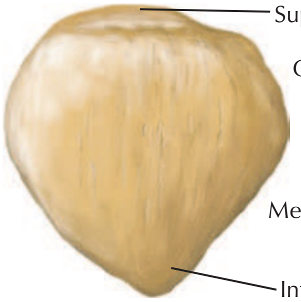

Testicular artery
External oblique, internal oblique, and transverse abdominis muscles
Femoral nerve
Pyrimidalis muscle
Inguinal canal
Iliopsoas muscle
Sartorius muscle
Acetabular labrum
Rectus abdominis muscle
Tensor fasciae latae muscle
Rectus femoris muscle
Ductus deferens
Pubofemoral ligament
External iliac artery and vein
Iliofemoral ligament
Adductor longus muscle
Gluteus minimus muscle
Gluteus medius muscle
Pectineus muscle
Joint fluid
Ligament of femoral head
Urinary bladder
Gluteus maximus tendon
Femoral head
Prostate
Greater trochanter
Rectum
Ischiofemoral ligament
Levator ani muscle
Acetabular labrum
Gluteus maximus muscle
Coccyx
Superior gemellus muscle and tendon
Obturator internus muscle and tendon
Obturator internus muscle
Sciatic nerve
Sacrotuberous ligament
Transverse acetabular ligament
Acetabulum
F. Netter M.D.
K. Marzen


Femoral artery
Descending genicular artery
Articular branch
Saphenous branch
Femoral artery passing through adductor hiatus within adductor magnus muscle
Superior medial genicular artery
Superior lateral genicular artery
Popliteal artery (*phantom*)
Patellar anastomosis
Middle genicular artery (*phantom*)
Inferior lateral genicular artery (*partially in phantom*)
Inferior medial genicular artery (*partially in phantom*)
Posterior tibial recurrent artery (*phantom*)
Anterior tibial recurrent artery
Circumflex fibular branch
Posterior tibial artery (*phantom*)
Anterior tibial artery
Fibular artery (*phantom*)
Interosseous membrane
Fibular artery (*phantom*)
Anterior tibial artery
Perforating branch
Anterior medial malleolar artery
Anterior lateral malleolar artery
Lateral tarsal branch
Medial tarsal branch
Arcuate artery
Posterior perforating branch
Dorsalis pedis artery
Plantar arch (*phantom*)
Deep plantar artery
Dorsal metatarsal arteries
Dorsal digital arteries

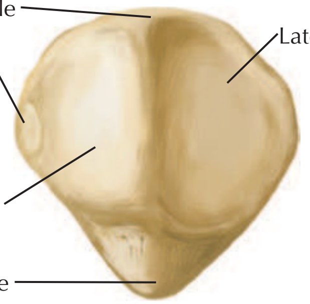

Patellar ligament insertion
Tibialis anterior muscle
Tibialis posterior muscle
Anterior tibial artery
Extensor digitorum longus muscle
Common fibular nerve
Flexor hallucis longus muscle
Fibularis longus muscle
Fibularis brevis muscle
Fibula
Tibia
Posterior tibial artery and vein
Sartorius tendon
Saphenous nerve
Great saphenous vein
Popliteus muscle
Tibial nerve
Soleus muscle
Gastrocnemius muscle
Medial sural cutaneous nerve
Tibialis anterior muscle
Extensor hallucis longus muscle
Extensor digitorum longus muscle
Superficial fibular nerve
Deep fibular nerve
Anterior tibial artery
Interosseous membrane
Fibularis longus muscle
Fibularis brevis muscle
Tibialis posterior muscle
Fibular artery
Flexor digitorum longus muscle
Tibial nerve
Posterior tibial artery
Flexor hallucis longus muscle
Soleus muscle
Plantaris tendon
Gastrocnemius muscle
Medial sural cutaneous nerve
Tibialis anterior muscle and tendon
Extensor hallucis longus muscle
Extensor digitorum longus and fibularis tertius muscles
Deep fibular nerve
Fibularis longus muscle
Anterior tibial artery
Fibularis brevis muscle
Interosseous membrane
Flexor digitorum longus muscle
Tibialis posterior muscle
Fibular artery
Posterior tibial artery
Tibial nerve
Flexor hallucis longus muscle
Calcaneal tendon
Soleus muscle
Sural nerve
F. Netter M.D.
K. Marzen

Osteology of Knee

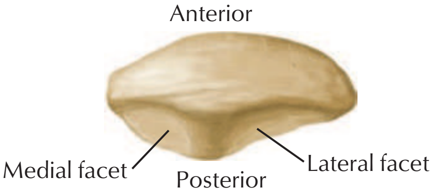

Lateral epicondyle
Lateral condyle
Trochlear groove
Adductor tubercle
Medial epicondyle
Medial condyle
Intercondylar fossa
Lateral epicondyle
Lateral condyle


Superior pole
Inferior pole

Anterior view

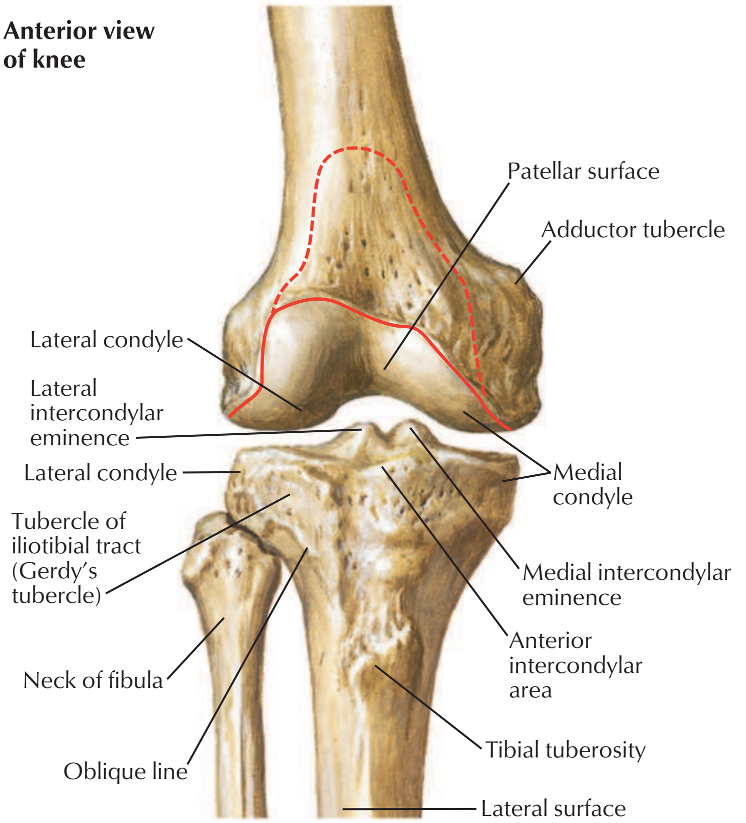

Odd facet
Lateral facet
Medial facet

Posterior view


Anterior
Medial facet
Posterior
Lateral facet

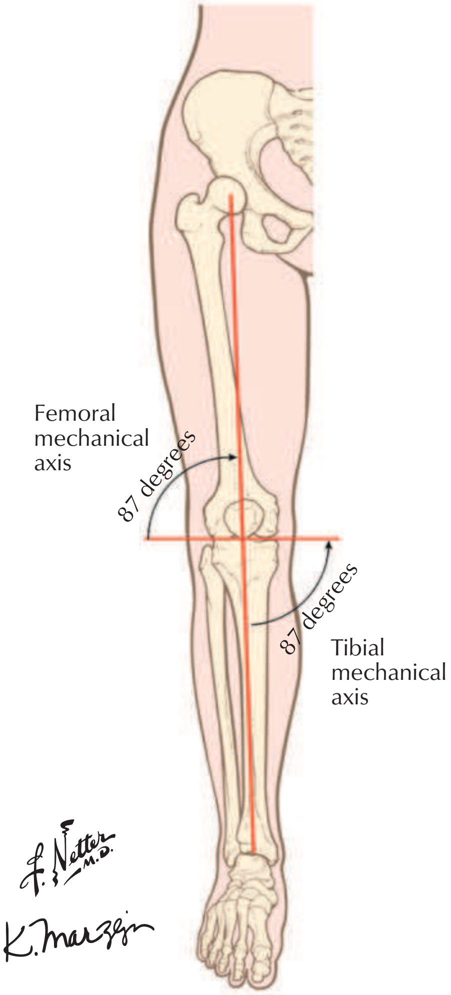
Superior view

Anterior view of knee


Patellar surface
Adductor tubercle
Lateral condyle
Lateral intercondylar eminence
Lateral condyle
Tubercle of iliotibial tract (Gerdy's tubercle)
Neck of fibula
Oblique line
Medial condyle
Medial intercondylar eminence
Anterior intercondylar area
Tibial tuberosity
Lateral surface

— Line of attachment of synovium (edge of articular cartilage) to distal femur

- - - - Line of reflection of synovial membrane


Femoral mechanical axis
87 degrees
87 degrees
Tibial mechanical axis

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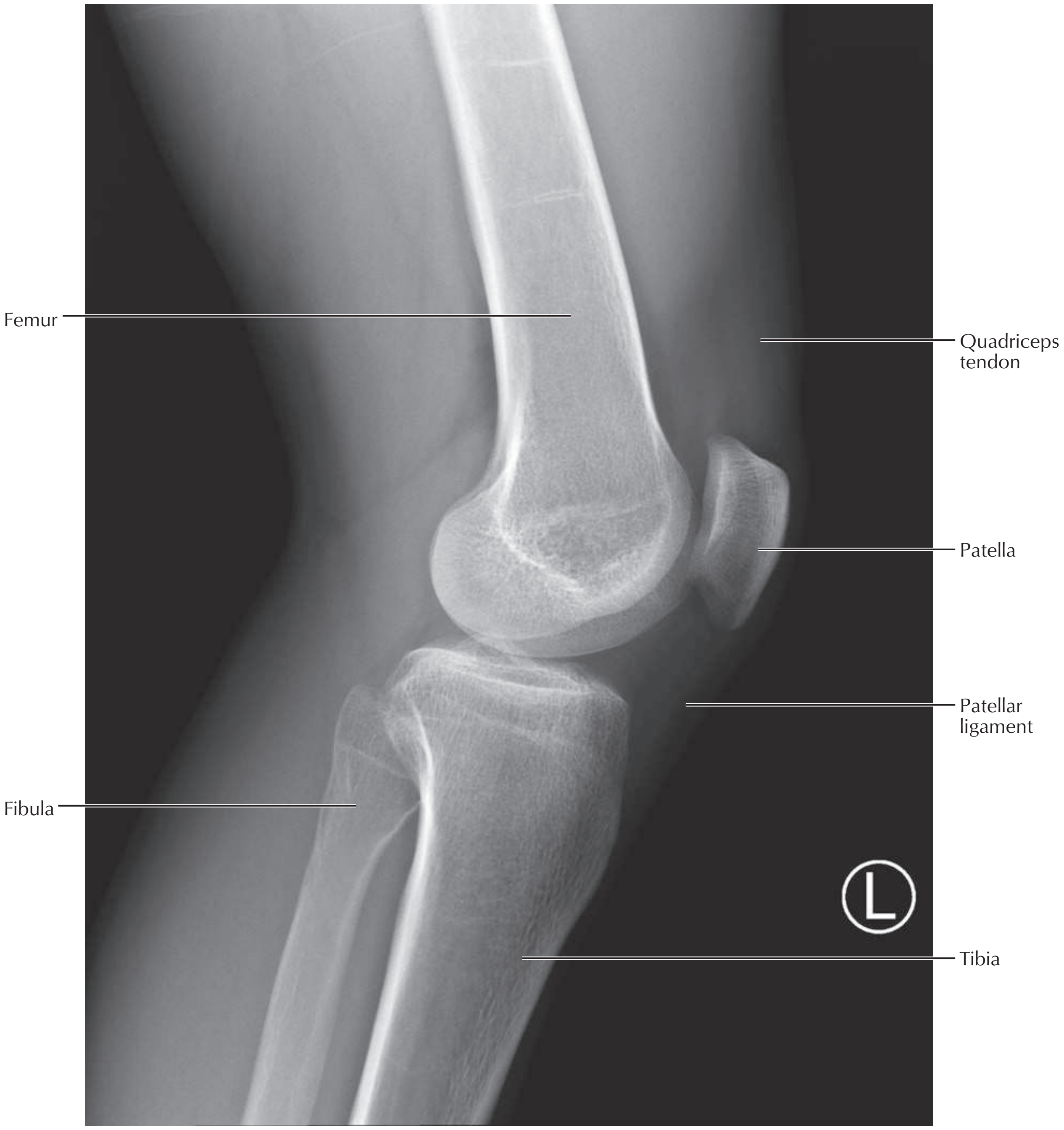
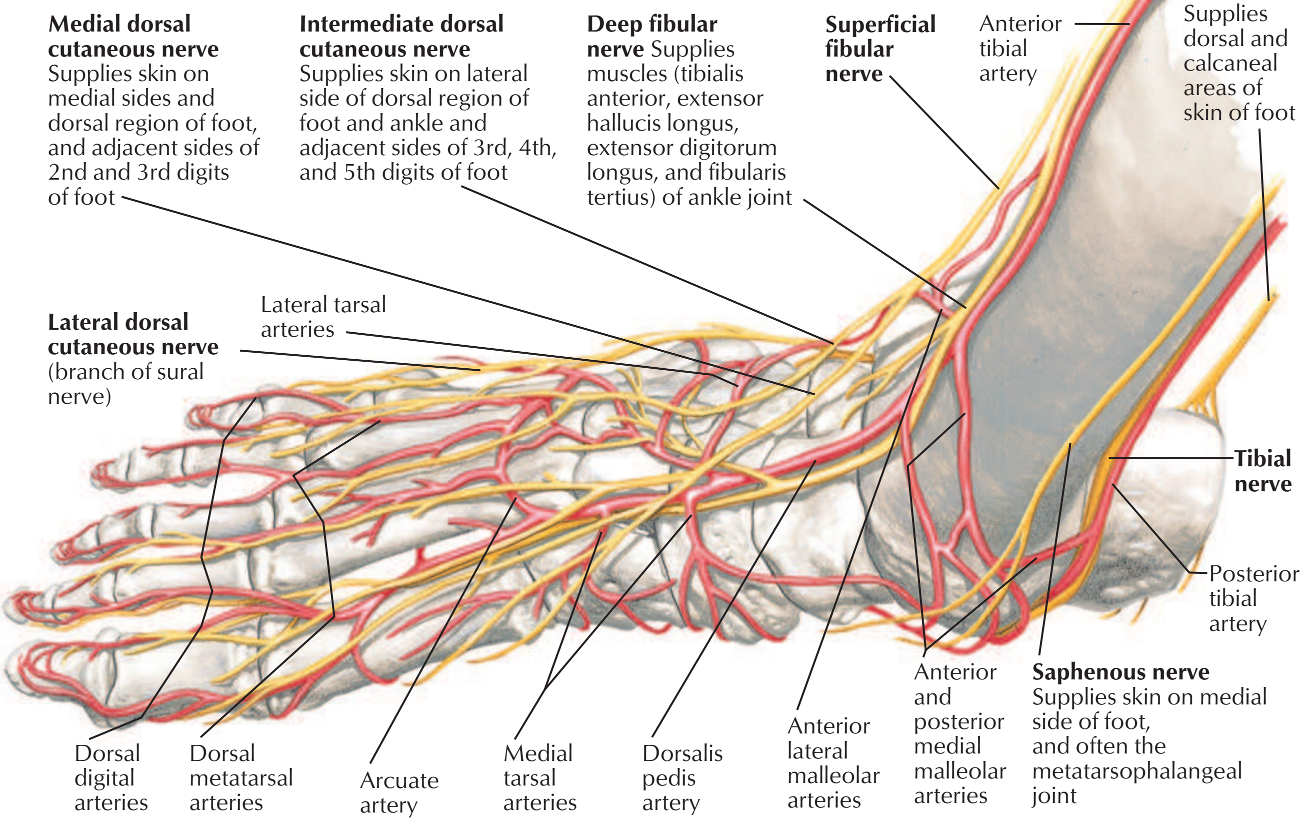
K. Marzejon

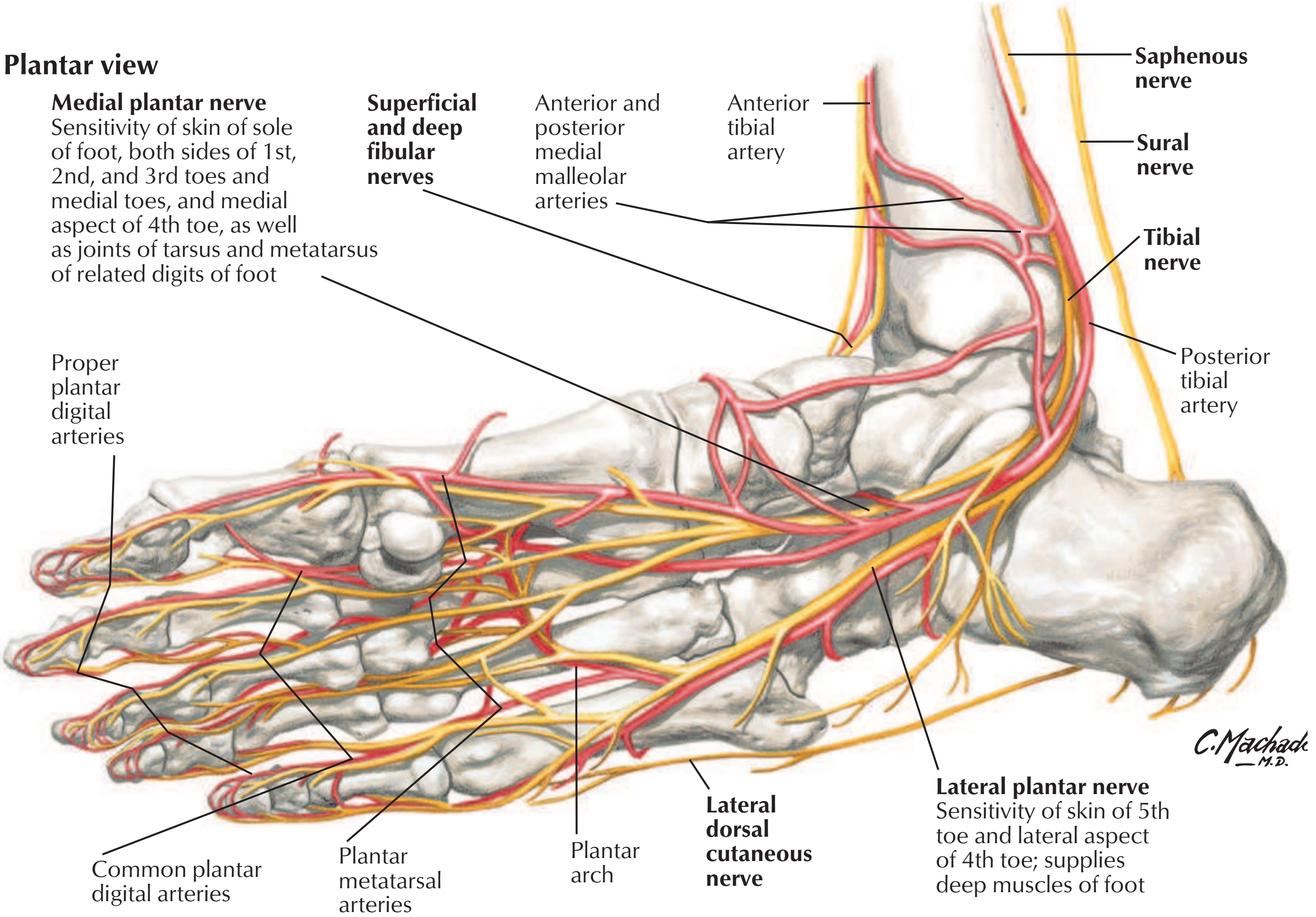

Femur
Quadriceps tendon
Patella
Patellar ligament
Fibula
L
Tibia

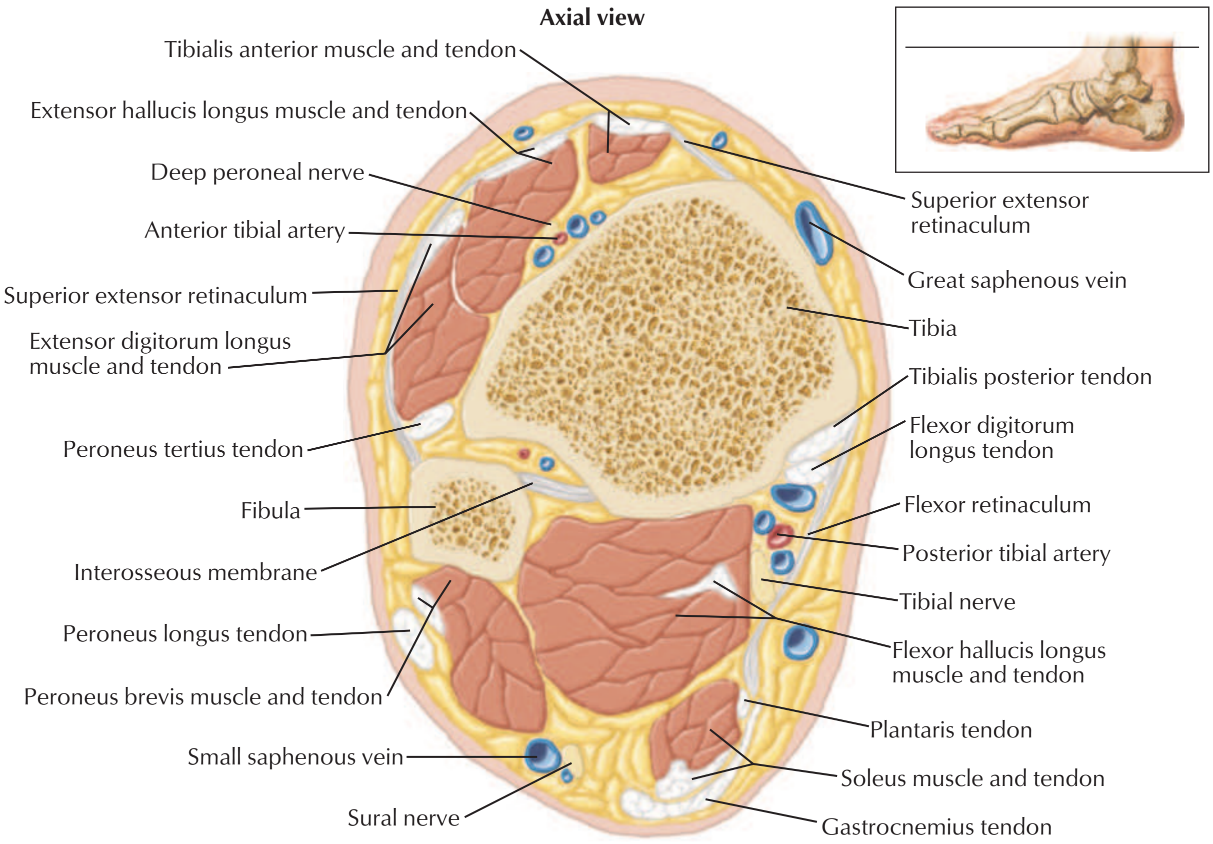
Anatomy of Foot: Nerves and Arteries

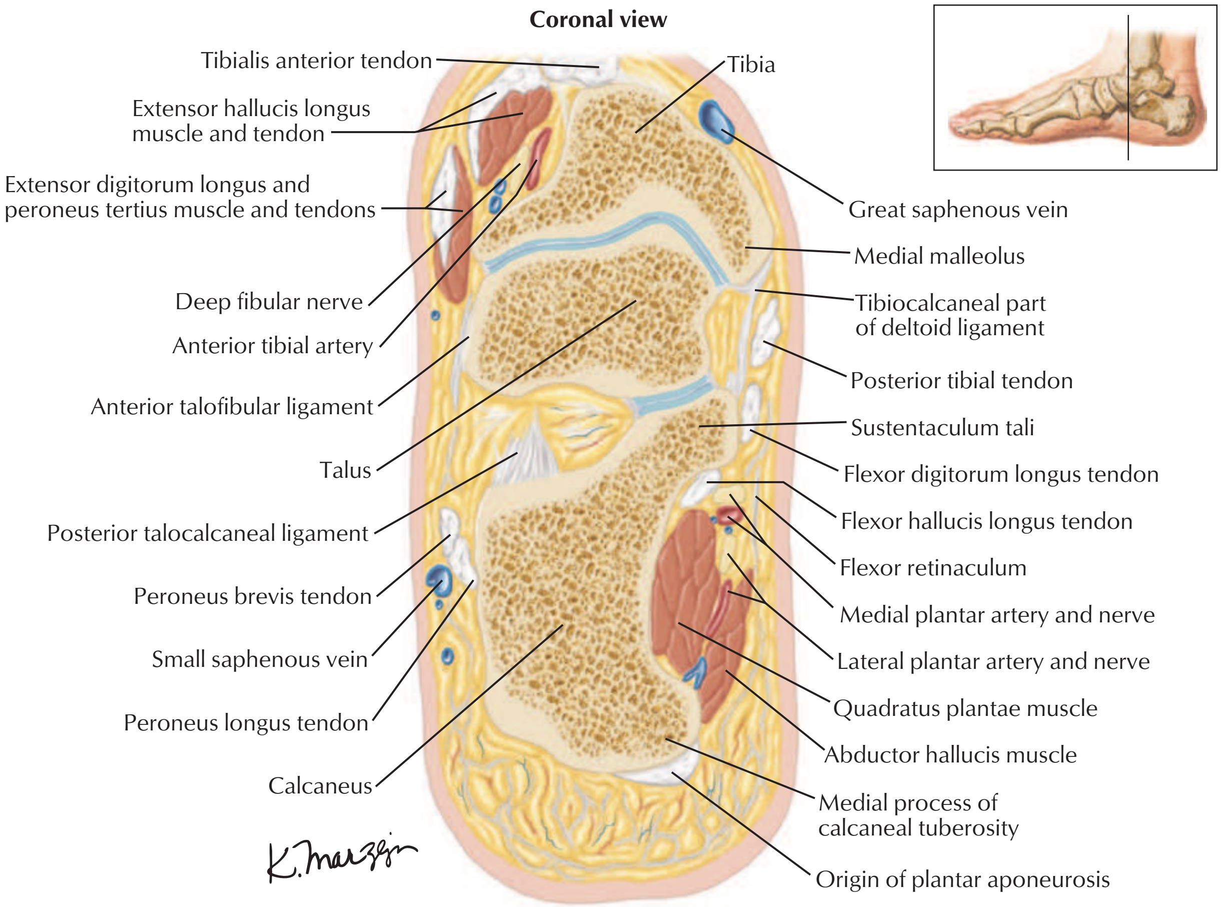
Dorsal view


Medial dorsal cutaneous nerve Supplies skin on medial sides and dorsal region of foot, and adjacent sides of 2nd and 3rd digits of foot
Intermediate dorsal cutaneous nerve Supplies skin on lateral side of dorsal region of foot and ankle and adjacent sides of 3rd, 4th, and 5th digits of foot
Deep fibular nerve Supplies muscles (tibialis anterior, extensor hallucis longus, extensor digitorum longus, and fibularis tertius) of ankle joint
Superficial fibular nerve
Anterior tibial artery
Sural nerve Supplies dorsal and calcaneal areas of skin of foot
Lateral tarsal arteries
Lateral dorsal cutaneous nerve (branch of sural nerve)
Tibial nerve
Posterior tibial artery
Dorsal digital arteries
Dorsal metatarsal arteries
Arcuate artery
Medial tarsal arteries
Dorsalis pedis artery
Anterior lateral malleolar arteries
Anterior and posterior medial malleolar arteries
Saphenous nerve Supplies skin on medial side of foot, and often the metatarsophalangeal joint

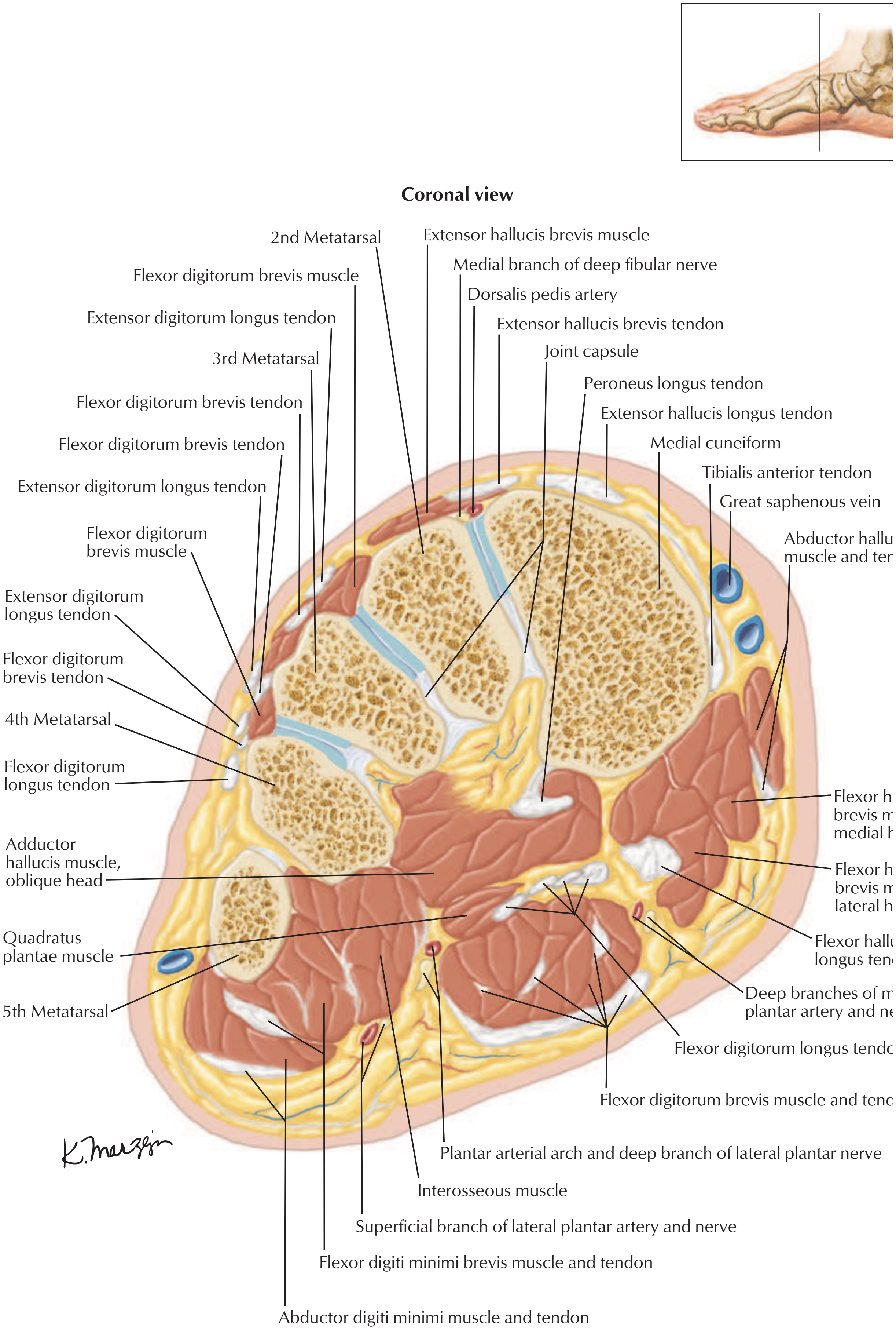
Plantar view

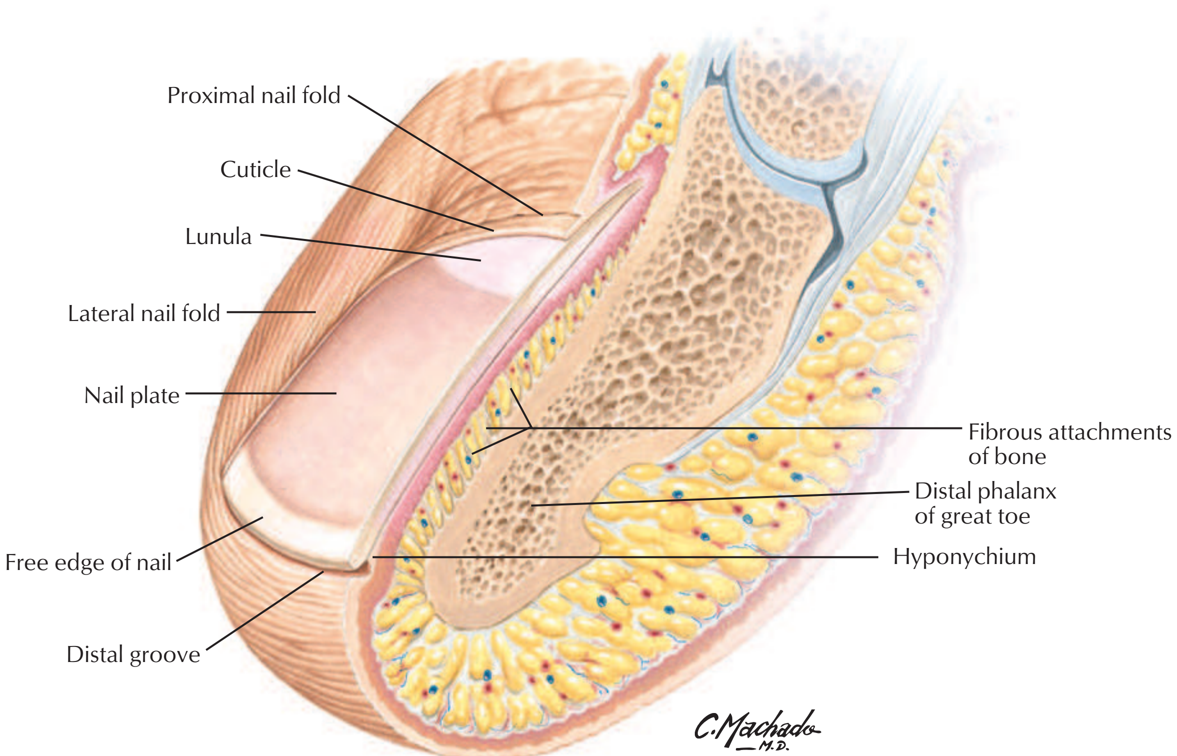

Medial plantar nerve Sensitivity of skin of sole of foot, both sides of 1st, 2nd, and 3rd toes and medial toes, and medial aspect of 4th toe, as well as joints of tarsus and metatarsus of related digits of foot
Superficial and deep fibular nerves
Anterior and posterior medial malleolar arteries
Anterior tibial artery
Saphenous nerve
Sural nerve
Tibial nerve
Posterior tibial artery
Proper plantar digital arteries
Common plantar digital arteries
Plantar metatarsal arteries
Plantar arch
Lateral dorsal cutaneous nerve
Lateral plantar nerve Sensitivity of skin of 5th toe and lateral aspect of 4th toe; supplies deep muscles of foot


Axial view
Tibialis anterior muscle and tendon
Extensor hallucis longus muscle and tendon
Deep peroneal nerve
Anterior tibial artery
Superior extensor retinaculum
Extensor digitorum longus muscle and tendon
Peroneus tertius tendon
Fibula
Interosseous membrane
Peroneus longus tendon
Peroneus brevis muscle and tendon
Small saphenous vein
Sural nerve
Superior extensor retinaculum
Great saphenous vein
Tibia
Tibialis posterior tendon
Flexor digitorum longus tendon
Flexor retinaculum
Posterior tibial artery
Tibial nerve
Flexor hallucis longus muscle and tendon
Plantaris tendon
Soleus muscle and tendon
Gastrocnemius tendon

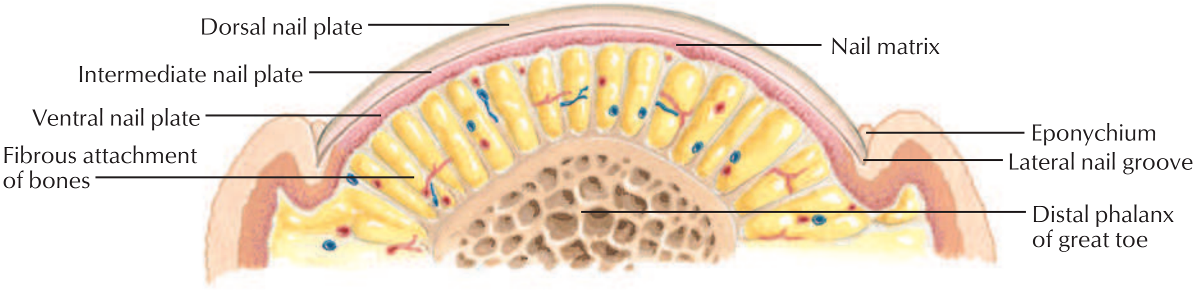

Coronal view
Tibialis anterior tendon
Extensor hallucis longus muscle and tendon
Extensor digitorum longus and peroneus tertius muscle and tendons
Deep fibular nerve
Anterior tibial artery
Anterior talofibular ligament
Talus
Posterior talocalcaneal ligament
Peroneus brevis tendon
Small saphenous vein
Peroneus longus tendon
Calcaneus
Tibia
Great saphenous vein
Medial malleolus
Tibiocalcaneal part of deltoid ligament
Posterior tibial tendon
Sustentaculum tali
Flexor digitorum longus tendon
Flexor hallucis longus tendon
Flexor retinaculum
Medial plantar artery and nerve
Lateral plantar artery and nerve
Quadratus plantae muscle
Abductor hallucis muscle
Medial process of calcaneal tuberosity
Origin of plantar aponeurosis

Cross-Sectional Anatomy of Ankle and Foot (continued)

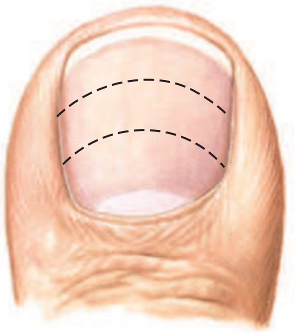

Coronal view
2nd Metatarsal
Flexor digitorum brevis muscle
Extensor digitorum longus tendon
3rd Metatarsal
Flexor digitorum brevis tendon
Flexor digitorum brevis tendon
Extensor digitorum longus tendon
Flexor digitorum brevis muscle
Extensor digitorum longus tendon
Flexor digitorum brevis tendon
4th Metatarsal
Flexor digitorum longus tendon
Adductor hallucis muscle, oblique head
Quadratus plantae muscle
5th Metatarsal
Extensor hallucis brevis muscle
Medial branch of deep fibular nerve
Dorsalis pedis artery
Extensor hallucis brevis tendon
Joint capsule
Peroneus longus tendon
Extensor hallucis longus tendon
Medial cuneiform
Tibialis anterior tendon
Great saphenous vein
Abductor hallu muscle and ter
Flexor h brevis m medial h
Flexor h brevis m lateral h
Flexor hallu longus ten
Deep branches of m plantar artery and ne
Flexor digitorum longus tendo
Flexor digitorum brevis muscle and tend
Plantar arterial arch and deep branch of lateral plantar nerve
Interosseous muscle
Superficial branch of lateral plantar artery and nerve
Flexor digiti minimi brevis muscle and tendon
Abductor digiti minimi muscle and tendon


Proximal nail fold
Cuticle
Lunula
Lateral nail fold
Nail plate
Free edge of nail
Distal groove
Fibrous attachments of bone
Distal phalanx of great toe
Hyponychium

Section of toe


Dorsal nail plate
Intermediate nail plate
Ventral nail plate
Fibrous attachment of bones
Nail matrix
Eponychium
Lateral nail groove
Distal phalanx of great toe

Cross section of toenail



Toenail growth

The average growth rate of toenails is about 1 mm a month.

The rounded shape of the free edge of the nails is dictated by the shape of the lunula. After avulsion of a nail, the free edge of the new one grows parallel to the lunula.

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Plates 31-36, 55, 56, 69, 75, 81

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Plates 115, 151
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Plates 127-129, 135
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Plates 169, 184
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Plate 171
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Plates 171, 403
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Plate 206, 207
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INDEX

References are to plate numbers. In most cases, structures are listed under singular nouns

A

A1 pulley fibers, BP106
Abdomen, 249–332
  autonomic nerves and ganglia, 300
  axial CT images of, BP87, 326–327
  bony framework of, 250
  cross section of, BP84
  left lower quadrant of, 251
  left upper quadrant of, 251
  regions and planes of, 251
  right lower quadrant of, 251
  right upper quadrant of, 251
  superficial fascia of, 252
  surface anatomy of, 249
  transverse section of, 85–86
Abdominal aorta, BP56, BP84, BP98, T5.2, 185, 201, 217, 236, 266, 271, 274, 276, 278, 291, 295, 306, 311, 313, 317, 324, 330–332, 344, 346, 348, 380, 382–384, 394
Abdominal aortic plexus, 303, 392, 394, 396, 398–399. *See also* Intermesenteric (abdominal aortic) plexus
Abdominal cavity, BP3
Abdominal muscles, 344, 348
Abdominal oblique muscle, external, 413–414
Abdominal ostium, 355
Abdominal viscera, 270
Abdominal wall
  anterior, 266–267, 317
    arterial anastomoses of, T5.2
    arteries of, 258
    deep dissection of, 254
    intermediate dissection of, 253
    internal view of, 256
    nerves of, 260
    superficial dissection of, 252
    veins of, 259
    venous anastomoses of, T5.2
  paramedian (parasagittal) section of, 324
  posterior
    arteries of, 266
    internal view of, 265
    lymph vessels and nodes of, 268
    nerves of, 269
    peritoneum of, 275
    veins of, 267
  posterolateral, 257
Abdominis muscle
  rectus, 344, 347–349, 359, 379
  transverse, BP109
  transversus, 181, 185
    tendon of origin of, 181–182
Abdominopelvic cavity, BP3
Abducens nerve (CN VI), BP26, T2.2, 60, 64, 96–98, 115, 124, 128
  distribution of, 129
  imaging of, BP32
  schema of, 132
  in superior orbital fissure, 20
Abducens nucleus, 127–128, 132
Abduction, of lower limbs movements, 472
Abductor digiti minimi muscle, BP117, T8.3, T7.3, 452, 455, 460, 467, 520, 522, 524–527, 532
  nerve to, 525
Abductor digiti minimi tendon, BP117, 519
Abductor hallucis muscle, BP117, T8.3, BP116, 520, 522, 524–526, 532
  insertion of, 527
Abductor hallucis nerve, 532
Abductor hallucis tendon, BP117, 519, 524–525
Abductor pollicis brevis muscle, T7.3, 452, 455–456, 466
Abductor pollicis longus muscle, T7.3, 431, 434–435, 439–441, 469
Abductor pollicis longus tendon, 434, 438, 441, 457, 459–460
Aberrant ductule, 372
Accessory nerve (CN XI), T2.2, 39–41, 49, 64, 76, 82, 85–86, 115, 124, 127–128, 138, 140, 183, 417
  cranial root of, 138
  distribution of, 129
  in jugular foramen, 20
  in jugular fossa, 19
  schema of, 138
  spinal roots of, 20, 138
    in foramen magnum, 19
Accessory nucleus, 127–128
Accessory oculomotor nucleus, 127–128, 132, 143
Accessory process, 164
Accessory saphenous vein, BP107
Acetabular branch, 495
Acetabular fossa, 400
  fat in, 477
Acetabular labrum, 338, 477, 495
  superior, 534
Acetabular ligament, transverse, 338, 477
Acetabular margin, 337–338, 342
Acetabular notch, 338, 476
Acetabulum, BP5, BP109, 338, 476, 478
  lunate (articular) surface of, 400, 477
  margin of, 476
  radiograph of, 335
Acetabulum labrum
  anterior, 534
  posterior, 534
Achilles tendon, 518. *See also* Calcaneal tendon
Acinus, BP48
Acoustic meatus
  external, BP28, BP24, 13, 17, 22, 105–106, 109
  internal, BP28, 15, 20, 105, 134–135
Acoustic opening, internal, 110
Acromial anastomosis, 418
Acromial plexus, 418
Acromioclavicular joint, 412, 415
  capsule, 412
Acromioclavicular ligament, 412
Acromion, BP5, BP23, 36, 194, 402, 409–413, 415, 417–419, 421, 470
  of scapula, 192
Adamkiewicz, artery of, 176
Adduction, of lower limbs movements, 472
Adductor brevis muscle, T8.3, T8.1, 480–481, 483, 491, 496, 530
Adductor canal, BP107, 490
Adductor compartment, BP104
Adductor hallucis muscle, BP117, T8.3, 526
  deep branch to, 532
  insertion of, 527
  oblique head of, 526
  transverse head of, 526
Adductor hallucis tendon, 519
Adductor hiatus, 491–492, 503
Adductor longus muscle, T8.3, T8.1, BP109, 400, 480–483, 490–491, 496, 530
Adductor magnus muscle, T8.3, T8.1, 395, 471, 480–481, 483, 485, 490–492, 494, 496, 503, 530–531
  adductor hiatus within, femoral artery passing through, BP108
  adductor minimus part of, 483, 485, 492, 494
  femoral artery, passing through adductor hiatus within, BP110
Adductor magnus tendon, 483, 491, 497, 502, 508
Adductor minimus muscle, 395
Adductor pollicis muscle, T7.3, BP105, 452–453, 455–456, 467
Adductor thigh muscle, T8.1
Adductor tubercle, 479
  on medial epicondyle of femur, 491, 500
Aditus; *See* (aditus)
Adnexa, 355
Adrenal glands, BP38, BP57. *See also* Suprarenal glands
Adrenergic synapses, BP42
  schema of, BP41
Adventitia, BP16
Afferent fibers, 309
  of autonomic reflex pathways, 307
  of kidneys and upper ureters, 321
  of lower ureter, 399
  of reproductive organs, 397
    male, 398
  of tracheobronchial tree, 214
  of urinary bladder, 399
Agger nasi, 43–44
Aggregate lymphoid nodules, 279. *See also* Peyer's patches (aggregate lymphoid nodules)
Ala, 17, 166
  of ilium, 250, 334, 338, 342
  of nose, 8
  of sacrum, radiograph of, 335
Alar cartilage
  major, 42, 44–45, 49
    lateral crus of, 42
    medial crus of, 42, 45
  minor, 42
Alar fascia, 33–34
Alar fibrofatty tissue, 42, 44
Alar folds, 498
Alar ligaments, 30
Alveolar artery
  inferior, 47, 57–58, 69, 84
    lingual branch of, 83
    mental branch of, 57, 83
    mylohyoid branch of, 25, 83
  superior, 57
    anterior, 57, 63
    middle, 57, 63
    posterior, 57, 60, 63, 83
Alveolar capillary, BP50
Alveolar ducts, BP48
  opening of, BP48
Alveolar foramina, 13
Alveolar macrophage, BP50
Alveolar nerve
  inferior, 25, 56–57, 59–60, 66, 69, 82, 133, 142, 145
  superior
    dental branches of, 63
    gingival branches of, 63
    infraorbital, 60
    middle, 66
    posterior, 60
Alveolar pores (of Kohn), BP48
Alveolar process, of maxillary bone, BP22, 11, 13, 15, 23, 44, 50
Alveolar sac, BP48
Alveolar veins
  inferior, 84
  posterior superior, 84
Alveolar wall
  capillary bed within, BP49
  capillary plexuses within, BP49
Alveoli, BP48, BP50
Amacrine cells, 131
Amorphous matrix, BP6

Ampulla, 355
  of ductus deferens, BP93, 366
  of ear, 109
    anterior, 108
    lateral, 108
    posterior, 108
  of rectum, 350
  of uterine tube, 357
Amygdaloid body, 121, 123, 130, 146
Anal canal, 375
  arteries of, 380
  muscularis mucosae of, 375–376
  veins of, 381
Anal cleft. *See* Intergluteal cleft
Anal columns, Morgagni's, 375
Anal crypt, 375
Anal glands, 375
Anal nerves, inferior, 306, 361, 392–393, 395–396, 487, 493
Anal pit, 370
Anal region, 3
Anal sinus, 375
Anal sphincter muscle
  external, T6.3, 283, 306, 339, 345, 349–350, 359–360, 363–364, 373–374, 376–377, 380, 386
    attachment of, 341
    deep, 324, 349, 373, 376–378
    subcutaneous, 324, 349, 373, 376–378
    superficial, 324, 349, 373, 376–378
  internal, 374, 376
Anal triangle, 362
Anal tubercle, 370
Anal valve, 375
Anal verge, 375
Anastomosis
  between medial and lateral circumflex femoral arteries, 495
  paravertebral, 177
  patellar, 503
  prevertebral, 177
Anastomotic loops
  to anterior spinal artery, 176
  of ileum, 279
  of jejunum, 279
  to posterior spinal artery, 176
Anastomotic vein
  inferior (of Labbé), 113, 156
  superior (of Trolard), 113
Anatomical snuffbox, 402, 434
Anconeus muscle, T7.3, 410, 422, 434–435, 440–441, 468–469
Angle of mandible, 8, 12, 22, 24, 76, 79
Angular artery, 10, 42, 57, 83, 99, 149
Angular gyrus, 116
  artery to, 152–153
Angular vein, 10, 84, 99
Ankle, T8.1
  cross-sectional anatomy of, 115–116
  ligaments of, 518
  radiographs of, 535
  tendon of, 518
  tendon sheaths of, 520
Annular hymen, BP96
Anococcygeal body, 341, 359–360, 377–378
Anococcygeal ligament, 364, 378
Anococcygeal nerves, 393, 395, 487, 489
Anoderm, 375
Anorectal flexure, 400
Anorectal hiatus, 342
Anorectal junction, 343
Anorectal line, 375
Anorectal musculature, 376
Ansa cervicalis, 38–41, 139–140
  inferior root of, 39–41, 82, 87, 139–140
  superior root of, 39–41, 82, 87, 139–140
Ansa of Galen, 92
Ansa pectoralis, 419
Ansa subclavia, 141, 213, 230–231, 243
Anserine bursa, 498
  deep to semitendinosus, 497
Antebrachial cutaneous nerve
  lateral, 404–406, 421, 425, 436, 438, 441, 459, 462–465
  medial, 404–405, 419–420, 423, 425, 441, 459, 462–466
  posterior, 404–406, 422, 425, 441, 458–459, 462, 464, 468–469
Antebrachial fascia, 441
Antebrachial region
  anterior, 2
  posterior, 2–3
Antebrachial vein, median, BP99, 402, 405–406, 441
Anterior chamber
  of eye, 94, 100, 102–103
  of eyeball, 101
Anterior femoral cutaneous vein, BP107
Anterior plane, 1
Anterior ramus, 177
Anterior root, 177
  rootlets of, 174
Anterior root ganglion, 399
Anterior tibial artery, BP116, 512–513
Anterior tibial veins, BP107
Anterolateral system (ALS), BP43
Antidromic conduction, BP41
Antihelix, 8, 106
  crura of, 106
Antitragus, 8, 106
Anular ligaments, 208
Anulus fibrosus, 164, 168
Anus, 341, 345, 358, 362, 364, 370, 377
Aorta, BP44, BP38, BP87, 33, 149, 177, 211, 217, 223–224, 233, 244, 309, 323, 325, 327, 385
  abdominal, BP84, T5.2, 185, 266, 271, 274, 276, 278, 291, 295, 306, 311, 313, 317, 324, 330–332, 344, 346, 348, 380, 382–384, 394
  ascending, BP57, 149, 219, 221, 224, 227–229, 244, 247
  descending, 149
  thoracic, 4, 177
  ureteric branch from, 317
Aortic arch, BP23, BP57, 4, 87–88, 149, 217
Aortic arch lymph node of ligamentum arteriosum, 212
Aortic heart valve, BP57, 41–42, 217, 221, 225–229
  left semilunar cusp of, 225–229
  posterior semilunar cusp of, 225–229
  right semilunar cusp of, 225–229
Aortic hiatus, 201
Aortic nodes, lateral, 388
Aortic plexus, abdominal, 397
Aortic sinuses (of Valsalva), 227
Aorticorenal ganglion, BP39, 172, 269, 303–304, 306, 320–322, 391, 396–397, 399
  left, 299, 305, 392, 398
  right, 300, 305
Apical ligament, of dens, BP19, 30, 77–78
Apical trabeculations, 224
Aponeurosis, of external abdominal oblique muscle, 359, 363
Appendicular artery, 280, 294–295, 305
Appendicular vein, 298–299
Appendix, BP62, T5.1, 137, 282
  of epididymis, 369, 371
  of testis, 369, 371
Arachnoid, 111, 113
Arachnoid-dura interface, 113
Arachnoid granulations, 111–113, 120
Arachnoid mater, 120, 174, 177
Arch of aorta, BP56, BP51, 202, 210, 214–216, 218–219, 225, 229, 235–237, 240, 246
  lung groove for, 205
Arcuate artery, BP110, BP115, 314, 503, 512, 521, 527
Arcuate eminence, 18, 105
Arcuate ligament
  inferior, 343
  lateral, 201, 265
  medial, 201, 265
Arcuate line, 250, 254, 256, 258, 262, 334, 338–339, 342, 476
  of ilium, 340
Arcuate nucleus, 158
Arcuate popliteal ligament, 499
Arcuate pubic ligament, 359, 365
Arcus tendineus fasciae pelvis, 354
Areola, 188
Areolar glands (of Montgomery), 188
Areolar tissue, 185, 349
  loose, 113
Areolar venous plexus, 259
Arm
  arteries of, BP100, 424
  muscles of
    anterior views of, 421
    posterior views of, 422
  radial nerve in, 468
  serial cross sections of, 425
Arrector pili muscle, 1–2
  innervation to, 172
Arteriae rectae, 294–295
Arterial arches, superficial palmar, 450
Arterial rete, marginal, 107
Arterial wall, BP16
  avascular zone, BP16
  matrix of, BP16
  vascular zone, BP16
Arteries. *See also specific arteries*
  of anal canal, 380
  of brain
    frontal section of, 152
    frontal view of, 152
    inferior view of, 150
    lateral view of, 153
    medial view of, 153
  of deep face, 63
  of ductus deferens, BP98, 380, 383
  of duodenum, 291, 293
  of esophagus, BP55, 240
  of eyelids, 99
  of hypothalamus and hypophysis, BP30
  of large intestine, 295
  of liver, 290–291
  of malleolar stria, 107
  of mammary gland, 189
  of nasal cavity, 47
  of oral and pharyngeal regions, 83
  of orbit, 99
  of pancreas, 291, 293
  of pelvic organs, female, 382
  of pelvis
    female, 383
    male, BP98, 385
  of penis, T6.2
  of perineum, 386
    male, 387
  of posterior cranial fossa, 154
  of rectum, 380
  of round ligament, 382
  of scalp, T2.2
  of small intestine, 294
  of spinal cord
    intrinsic distribution, 177
    schema of, 176
  of spleen, 290–291

Arteries *(Continued)*
  of stomach, 290
  of testis, 383
Arteriole
  intralobular, 286
  macular
    inferior, 103
    superior, 103
  nasal retinal
    inferior, 103
    superior, 103
  periportal, 286
  portal, 286
  temporal retinal
    inferior, 103
    superior, 103
Artery of Adamkiewicz, 176
Articular branch, 492, 529
Articular cartilage, BP5, BP106, BP114, 428, 460–461, 477
Articular cavity, BP19, 193, 460–461, 502
  of sternoclavicular joint, 408
Articular disc, BP102, 24–25, 60, 193
  of sternoclavicular joint, 408
Articular facet
  cervical, 26
    inferior, 27
    superior, 26
  of dens, posterior, 30
  inferior, 168
  for sacrum, 164
  thoracic, superior, 163
  vertebral body for, 193
    inferior, 193
    superior, 193
    transverse, 193
Articular nerve, recurrent, 533
Articular process
  cervical
    inferior, 26–28
    superior, BP18, 27–28
  lumbar
    inferior, 164, 167–168
    superior, 164, 167–168
  sacral, superior, 166
  thoracic
    inferior, 163
    superior, 163
Articular surface, superior, 505
Articular tubercle, 13, 17, 25, 56
Articularis genu muscle, T8.3, 480, 498, 502, 529
Aryepiglottic fold, 75, 79, 91
Arytenoid cartilage, 90
  muscular process of, 90–91
  vocal process of, 90–91
Arytenoid muscle
  oblique, T2.9, 75, 80, 91–92
    action of, 93
    aryepiglottic part of, 91–92
  transverse, T2.9, 75, 77, 80, 91–92
    action of, 93
Ascending cervical artery, 176
Ascending colon, 344, 348
  as site of referred visceral pain, BP13
Ascending fibers, 321, 399
Asterion, 13
Atlantoaxial articulation, BP35
Atlantoaxial joint, BP34
  lateral, 29
    capsule of, 29–30
  median, 30
Atlantoaxial ligament, 30
Atlantoaxial membrane, posterior, BP19
Atlantooccipital joint, capsule of, 29–30
Atlantooccipital junction, BP19
Atlantooccipital ligament, anterior, 30
Atlantooccipital membrane
  anterior, BP19, 29, 77–78
  posterior, BP19, 29
Atlas (C1), BP5, BP18, 22, 28–30, 169
  anterior arch of, BP35, BP42, BP34
  anterior tubercle of, 28
  anterior view of, 162
  arch of
    anterior, BP19, BP17, 14, 26, 28, 77
      imaging of, 160
    posterior, 26
  dens of, articular facet for, 26
  groove for vertebral artery of, 26
  inferior articular surface of, BP35
  inferior longitudinal band of cruciate ligament of, BP19
  inferior view of, 26
  lateral mass of, 12, 26
  left lateral view of, 162
  posterior arch of, BP35, BP19, BP17, BP34, 184
  posterior tubercle of, 182
  posterior view of, 162
  superior articular facet for, 26
  superior longitudinal band of cruciate ligament of, BP19
  superior view of, 26
  transverse foramen of, 26
  transverse ligament of, BP19, 30
    tubercle for, 26
  transverse process of, 26, 29, 37, 182
  tubercle of
    anterior, 26, 30
    posterior, 26, 181
  vertebral foramen of, 26
Atonic stomach, BP60
Atrial appendage. *See* Auricle (atrial appendage)
Atrioventricular (AV) bundle (of His), 229
Atrioventricular (AV) node, 229
Atrioventricular valve
  left, 220–221, 225–229, 248
    anterior cusp of, 225–228
    left fibrous ring of, 226
    posterior cusp of, 225–228
  right, 220–221, 224, 226–228
    anterosuperior leaflet (cusp) of, 224, 226–228
    inferior leaflet (posterior cusp) of, 224, 226–228
    orifice of, 248
    right fibrous ring of, 226, 229
    septal leaflet (cusp) of, 224, 226–228
Atrium, 228
  left, BP56, BP51, 217–220, 224–225, 227–228, 244, 248
    oblique vein of (of Marshall), 218–219, 222, 225
  right, BP51, 216, 218–221, 227–228, 234, 244, 248
Auditory canal, internal, imaging of, BP32
Auditory ossicles, BP4
Auditory tube, 27–29, 105–107, 109, 137
  cartilaginous part of, BP29, 49, 56, 67, 72, 75, 78
    lateral lamina of, BP29
    medial lamina of, BP29
  groove for, 17
  opening of, 43
  pharyngeal opening of, 72, 77, 79
Auerbach's plexus, BP54. *See also* Myenteric (Auerbach's) plexus
Auricle (atrial appendage), BP28, 14, 105, 110
  concha of, 106
  left, 56–57, 216, 218–219, 222–223, 225, 228–229
  lobule of, 106
  right, BP51, 216, 224, 228
Auricular artery
  anterior, 10
  deep, 57–58, 107
  posterior, 10, 41, 57, 60, 83, 107, 112, 147, 149, 184
Auricular cartilage, 49
Auricular muscle, branches to, 134
Auricular nerve
  great, 9, 38–40, 140, 183
  posterior, BP21, 54, 59, 134
    occipital branch of, 134
Auricular surface, 166
  of sacrum, 167, 476
Auricular tubercle (of Darwin), 106
Auricular vein, posterior, 10, 39, 84
Auricularis muscle
  anterior, BP20, T2.4, 31
  posterior, T2.4, 31
  superior, T2.4, 31
Auriculotemporal nerve, 9, 25, 53, 56–57, 59–60, 82–83, 133, 136, 145
  roots of, 60
Auscultation
  of heart, 217
  precordial areas of, 217
Autonomic nerves. *See also* Motor (autonomic) nerve
  in head, 142
  in neck, 141
  in thorax, 213
Autonomic neurons, postganglionic, BP11
Autonomic reflex pathways, 307
Axilla
  anterior view, 419
  posterior wall of, 414
Axillary artery, BP23, BP56, BP100, 4, 189, 195, 204, 258, 416, 418–419, 423–424
  acromial branch of, BP100
  clavicular branch of, BP100
  left, 199
  pectoral branch of, BP100
  right, 199
Axillary fasciae, 416
Axillary fold
  anterior, 187
  posterior, 187
Axillary fossa, 245–247
Axillary lymph nodes, 7, 41–42, 416
  anterior, 190
  apical, 190–191
  central, 190–191, 416
  lateral, 190–191, 407
  pectoral, 416
  posterior, 190–191
Axillary nerve, T7.1, 404, 414, 417, 419–420, 422, 464–466, 468–469
  branches of, 414
  superior lateral brachial cutaneous nerve from, 183, 404
Axillary region, 2
Axillary tail (of Spence), 189
Axillary vein, BP56, BP99, 5, 195, 204, 259, 407, 416
  intercostal tributaries, 259
  right, 217
Axis (C2), BP18, 22, 28–30, 169
  anterior view of, 26, 162
  body of, 26, 29
  dens of, BP19, 12, 14, 26, 28, 77
  inferior articular process, 26
  inferior articular surface of lateral mass for, 26
  interarticular part of, 26
  left lateral view of, 162
  odontoid process of, BP34
  pedicle of, 26
  posterior view of, 162
  posterosuperior view of, 26

Axis (C2) *(Continued)*
  spinous process of, BP19, 26, 180, 182
  superior articular facet of, BP35
  transverse process of, 26
    posterior tubercle of, 37
  vertebral body of, imaging of, 160
Axolemma, BP11
Axon hillock, BP11
Axon nerve, BP11
Axons, BP11
  myelinated, cell membrane of, BP12
Azygos vein, BP84, BP57, 198, 200, 210–211, 213, 220, 234, 241, 247–248, 328
  arch of, 236
  lung groove for, 205

B

Back, 161–186
  lumbar region of, 185
  muscles of
    deep layers, 182
    intermediate layers, 181
    superficial layers, 180
  nerves of, 183
  surface anatomy of, 161
Ball-and-socket joints, BP5
Bartholin's gland, 360–361, 371, 386
  opening of, 358
  primordium, 371
Basal nuclei, 121
Basal vein (of Rosenthal), 155–157
Basement membrane, BP8, BP93, BP16
Basilar artery, 147, 149–152, 154, 176
  imaging of, 31–32, 159–160
Basilar membrane, 109
Basilic hiatus, BP99
Basilic vein, BP99, 5, 402, 405–407, 419, 425, 441, 458
  median, BP99
Basivertebral vein, BP42, 178
Batson, internal vertebral venous plexus of, 177–178
Biceps brachii muscle, T7.3, T7.1, 187, 402, 409, 413–414, 416, 419, 421, 423, 425, 439–440, 463, 465
  long head of, 245
    tendon of, 246–247
Biceps brachii tendon, T7.1, 412, 415, 417, 421, 423, 428, 436–438
Biceps femoris muscle, T8.3, T8.1, 471, 480–481, 484–485, 492–493, 496–497, 501, 506–507, 510
  long head of, 395, 471, 510, 531
    tendon of, 494
  short head of, 395, 471, 510, 531
  superior bursa of, 494
Biceps femoris tendon, 497–498, 501–502, 505, 508–512, 533
Bicipital aponeurosis, 406, 421, 423, 436, 463
Bicipital groove, 409
Bifid spinous process, 27
Bifurcate ligament, 518
Bifurcation. *See* Pulmonary trunk
Bile ducts, 137, 173, 286
  common, BP62, BP87, 274, 278–279, 284–285, 287, 290–293, 329
    sphincter, 287
  innervation to, 172
Biliary disease, areas of referred pain in, 309
Bipolar cells, 131
Bladder, T6.1, BP88, BP109, BP89, 351, 359. *See also* Urinary bladder
  fundus of, 352
  lateral ligament of, 347
Bladder *(Continued)*
  neck of, 352
  pubocervical fascia, 354
  trigone of, 352, 356
  uvula of, 352, 366–367
Bladder-prostate gland junction, 400
Blood, composition of, BP15
Blood vessels. *See* Vessels
Bloodless fold of Treves, 280. *See also* Ileocecal fold (bloodless fold of Treves)
Body cavities, BP3
  dorsal, BP3
  ventral, BP3
Body planes, terms and relationship of, 1
Bohler's angle, 517
Bone marrow, 7
Bones
  architecture of, BP7
  of foot, 515
  of nasal cavity, 52
  of paranasal sinuses, 52
  of thorax, 192
Bony labyrinth, 108–109
Bony spicule, 27
Bouton, BP11
Brachial artery, T7.2, 4, 100–101, 189, 418–419, 421, 424–425, 436–438, 463
  branches of, 435
  lateral cord of, 423
  medial cord of, 423
  middle collateral branch of, 435
  muscular branch of, 423
  pulses at, 4
  in situ, 423
Brachial cutaneous nerve
  inferior lateral, 405, 422, 468–469
  medial, 405, 419–420, 423, 425, 463–466
  posterior, 405, 422, 464, 468–469
  superior lateral, 183, 405, 414, 417, 422, 468–469
Brachial fascia, 416, 425
Brachial plexus, 8, 36, 38–40, 82, 169, 189, 195, 199, 204, 210, 215, 232, 234–236, 416–417, 419
  anterior divisions of, 420
  inferior trunks of, 414, 420
  lateral cord of, 221, 416, 420, 464–466
  medial cord of, 416, 420, 464–466
  middle trunks of, 414, 420
  posterior cord of, 416, 420, 464–466
  posterior divisions of, 420
  roots of, 420
  schema of, 420
  superior trunks of, 414, 420
  terminal branches of, 420
  trunks of, 37, 414
Brachial region
  anterior, 2
  posterior, 2–3
Brachial veins, BP99, 5, 419, 425
Brachialis muscle, T7.3, 409–410, 419, 421, 423, 425, 436, 438–439, 463, 465
Brachiocephalic artery, 217
Brachiocephalic trunk, BP23, 40, 87–89, 147, 149, 196, 199, 210, 215–216, 218, 221, 236, 240, 245
Brachiocephalic vein, 5, 87, 196, 212
  left, BP51, BP57, 84, 88, 179, 198, 210, 215–216, 221, 234–236, 241, 245
  lung groove for, 205
  right, BP51, BP57, 88, 179, 198, 210, 215–217, 234, 237, 241, 245
Brachioradialis muscle, T7.3, 402, 409, 421–423, 425, 434–437, 439–441, 463, 468–469
Brachioradialis tendon, 438, 441
Brain, BP22, 6, 50
  arteries of, 147
    frontal section of, 152
    frontal view of, 152
    inferior view of, 150
    lateral view of, 153
    medial view of, 153
    schema of, 149
  axial and coronal MRIs of, BP32
  inferior view of, 118
  lateral view of, 116
  medial view of, 117
  veins of
    deep, 156
    subependymal, 157
  ventricles of, 119
Brainstem, 124
  cranial nerve nuclei in, 127–128
Breast, 217
  lymphatic drainage of, 191
  pathway to/from opposite, 190
  suspensory retinacula of, 188
Bregma, 16
Bridging vein, T2.2, 111, 113–114, 120
  imaging of, BP31, 159
Broad ligament, 344–346, 353, 371
  anterior lamina of, 357
  posterior lamina of, 357
Bronchi, BP41, 173, 208–209
  extrapulmonary, 208
  inferior lobar, 208
    anterior basal, 209
    anteromedial basal, 209
    lateral basal, 209
    medial basal, 209
    posterior basal, 209
  innervation to, 172
  intermediate, 205
  intrapulmonary, 208
  lingular, 208–209
    inferior, 209
    superior, 209
  main
    left, BP44, BP57, 205, 208, 210–211, 220, 235–238, 247
    right, BP44, BP57, 208, 211, 217, 220, 234, 236, 244, 247
  major, 208
  middle lobar, 208
    lateral, 209
    medial, 209
  nomenclature of, schema of, 209
  superior division, 208
    anterior, 209
    apicoposterior, 209
  superior lobar, 208
    anterior, 209
    apical, 209
    posterior, 209
    right, 210
Bronchial artery, BP49, 211, 234–235
  esophageal branch of, 211
  left, 205
    inferior, 211, 240
    superior, 211, 240
  right, 205, 211, 240
Bronchial veins, 211
  left, 211
  right, 211
Bronchioles
  respiratory, 48–49
  terminal, BP48
    elastic fibers of, BP48
    smooth muscle of, BP48
Bronchomediastinal lymphatic trunk, 212
Bronchopulmonary (hilar) lymph nodes, 193, 234–235

- **Bronchopulmonary segments**, 206–207
  - anterior, 206–207
    - basal, 206–207
  - anteromedial basal, 206–207
  - apical, 206–207
  - apicoposterior, 206–207
  - inferior lingular, 206–207
  - lateral, 206–207
    - basal, 206–207
  - medial, 206–207
    - basal, 206–207
  - posterior, 206–207
    - basal, 206–207
  - superior, 206–207
    - lingular, 206–207
- **Bronchus intermedius**, BP57
- **Buccal artery**, 57, 83
- **Buccal nerve**, 9, 57, 59–60, 66, 82, 133
  - long, 68
- **Buccinator lymph nodes**, 85
- **Buccinator muscle**, T2.4, BP22, 20–21, 31, 34, 50, 53, 55–56, 59, 67–68, 78, 81, 83, 134
- **Buccopharyngeal fascia**, 33, 68, 77–78
- **Buck's fascia**, 364. *See also* Deep (Buck's) fascia
  - intercavernous septum of, 367
  - of penis, BP88, BP98, 349, 362–365, 369, 377–378, 387
- **Bulbar conjunctiva**, BP26, 94, 100–101
- **Bulboreticulospinal tract**, BP43
- **Bulbospongiosus muscle**, BP90, T6.3, 324, 349, 352–353, 356, 359–361, 363, 365, 377–378, 386–387, 399
- **Bulbourethral (Cowper's) gland**, 256, 324, 349, 352, 365–367, 371
  - duct of, 365
  - primordium, 371
- **Bulbourethral ducts**, 366–367
- **Buttock, nerves of**, 493

C

- **Calcaneal artery**
  - lateral, 525–526
  - medial, 525–526
- **Calcaneal bursa, subcutaneous**, 520
- **Calcaneal nerve**
  - lateral, 525–526
  - medial, 525–526
- **Calcaneal sulcus**, 517
- **Calcaneal tendon**, BP111, T8.1, 471, 507–510, 518, 520, 535
  - soleus muscle into, 508
- **Calcaneal tuberosity**, 471, 507–508
  - medial process of, BP116
- **Calcaneocuboid ligament**, 518, 527
  - dorsal, 518
- **Calcaneofibular ligament**, 505, 517
- **Calcaneonavicular ligament**, 518
- **Calcaneus bones**, T8.1, BP116, 515–516, 519, 535
  - tuberosity of, 519, 525–526
- **Calcar avis**, 122–123
- **Calcarine sulcus**, 116–118, 122, 131
- **Callosomarginal artery**, 152–153
- **Calot's triangle**, 287
- **Calvaria**, 113
  - inferior view of, 16
  - superior view of, 16
- **Camper chiasm**, 451
- **Camper's fascia**, BP88. *See also* Fatty (Camper's) fascia
- **Camper's layer**, 252, 324, 359
  - of superficial fascia, 362
- **Canal of Schlemm**, 101, 103–104
- **Canine teeth**, 73–74
- **Capillaries**, BP6
  - in Haversian canal, BP7
- **Capillary lumen**, BP50
- **Capillary plexus**, BP50
- **Capitate bone**, BP102, 442–443, 445–447, 452
- **Capitohamate ligament**, 444–445
- **Capitotriquetral ligament**, BP102
- **Capitulum**, 409–410, 426–427
- **Capsular branches**, BP98
- **Capsular ligaments**, 412
- **Cardiac branches**, 172
- **Cardiac impression**, 205
- **Cardiac notch**, 239, 276
  - of left lung, 202, 205
- **Cardiac orifice**, 277
- **Cardiac plexus**, 39–40, 137, 213, 230–231, 243
- **Cardiac veins**, BP52
  - anterior, 222
  - great, 222
  - middle, 218, 222
  - small, 222
  - variations of, BP53
- **Cardiac zone**, 277
- **Cardinal (Mackenrodt's) ligament**, 346, 353–354
  - with uterine artery, 347
- **Cardiophrenic angle**, 217
- **Cardiovascular system**, T6.2, T3.1, T5.2, 41–42
  - composition of blood and, BP15
  - general organization of, BP14
- **Carina**, 217
- **Carinal lymph nodes, inferior**, 212
- **Caroticotympanic artery**, 148
- **Caroticotympanic nerve**, 134
- **Carotid artery**, 41
  - common, T2.2, 10, 33, 38, 40–41, 64, 76, 82–84, 87–89, 136, 139, 141–142, 144–145, 147, 149, 196, 204, 236, 240
    - left, BP51, 4, 179, 199, 210, 215–218, 221, 245
    - right, BP23, 4, 37, 179, 199, 210, 217
  - external, 10, 32, 35, 38, 41, 47, 53, 57, 60, 63–64, 68, 70, 76, 82–84, 87–89, 107, 112, 136, 141–142, 145, 147, 149
    - left, 58
    - right, BP23, 58
    - schema of, 41
  - internal, BP27, 10, 41, 49, 56, 60, 62, 64, 76, 82–83, 87–89, 99, 107, 112, 115, 136, 139, 141–145, 147, 149–152
    - caroticotympanic branch of, 149
    - in carotid canal, 19–20
    - cavernous part of, 148
    - cavernous segment of, 115
    - cerebral part of, 148
    - cervical part of, 148
    - imaging of, 31–32, 159–160
    - left, 153–154
    - meningohypophyseal trunk of, 112
    - petrous part of, 148
    - in petrous part of temporal bone, 148
    - right, BP23, 153
  - pulses at, 4
- **Carotid body**, 41, 136, 141, 147, 214
- **Carotid canal**, 17, 19–20
- **Carotid-cavernous sinus fistula**, T2.3
- **Carotid groove**, 18
- **Carotid nerve**
  - external, BP39, 172
  - internal, 62, 64, 141–142, 144, 172, 232
- **Carotid plexus**, 107, 142
  - common, 141–142
  - external, 141–142, 144
  - internal, 20, 97, 134, 142–143, 172
- **Carotid sheath**, 32–33
- **Carotid sinus**, T2.3, 136, 141, 147, 214
- **Carotid sinus nerve (of Hering)**, 136, 141–142
- **Carotid tubercle (of Chassaignac)**, 28
- **Carpal arch, dorsal**, 459
- **Carpal artery, dorsal**, BP101, 424
- **Carpal articular surface**, 429
- **Carpal bones**, BP4, 442–461
- **Carpal ligament**
  - palmar, 406, 436–437, 444, 449–450, 452, 456, 467
  - transverse, BP104
- **Carpal tunnel release**, BP104
- **Carpometacarpal joint**, 443, 445
  - 1st, BP102
- **Carpometacarpal ligaments**
  - dorsal, BP102
  - palmar, BP102, 448
- **Cartilage**, BP6
  - articular, BP6
  - of larynx, 90
  - of thyroid, 8
- **Cartilage end plate**, 168
- **Cast-off cytoplasm**, BP93
- **Cauda equina**, T3.1, 169–170, 185
  - anterior roots forming, 177
  - nerve roots, within thecal sac, BP38
  - posterior roots forming, 177
  - radiology of, 165
- **Caudal, as term of relationship**, 1
- **Caudate nucleus**, 121
  - anterior vein of, 156–157
  - body of, 117, 121
  - head of, 121–123, 154, 156
    - imaging of, BP32, 160
  - posterior terminal vein of, 157
  - posterior vein of, 156
  - tail of, 119, 121, 123
  - transverse veins of, 156–157
- **Caval foramen**, 265
  - opening of, 201
- **Cave of Retzius**, 324
- **Cavernous nerves**, BP40, T6.2
  - of penis, 392, 398
- **Cavernous plexus**, 132
- **Cavernous sinus**, 99, 115, 147, 151
- **Cavernous tissue**, T6.2
- **Cavernous vein**, 385
- **Cavernous venous plexus, of urethra**, BP90
- **Cavum septum pellucidum**, 111
- **Cecal artery**, 305
  - anterior, 280, 294–295
  - posterior, 280, 294–295
- **Cecal folds**, 280, 344, 348
- **Cecal vein**
  - anterior, 299
  - posterior, 298–299
- **Cecum**, BP62, BP66, 85–86, 137, 270, 272, 282–283, 344, 348
  - peritoneal attachment of, BP66
  - as site of referred visceral pain, BP13
  - vascular fold of, 280
- **Celiac branch**, 392
- **Celiac ganglion**, BP39, BP41, BP84, T5.2, 172–173, 300–301, 303–306, 309–310, 320–322, 391–392, 396–399
- **Celiac nodes**, 242, 268
- **Celiac plexus**, 301, 304–305, 321, 392, 397
  - posterior vagal trunk to, 243
- **Celiac trunk**, BP57, 4, 201, 233, 236, 240, 266, 271, 288, 292–293, 303, 310, 324, 392
  - arteriogram of, 292
  - variations in, BP72
- **Central arteries**
  - anterolateral, 148, 150–152, 154
  - anteromedial, 151
  - posteromedial, 151
- **Central axillary nodes**, 190
- **Central canal**, 128
  - of spinal cord, 120, 125

Central nervous system, 6
Central sulcus (of Rolando), 116–117
Central tendon, of diaphragm, 200
Central vein, 285–286
Cephalic vein, BP99, 187, 194–195, 221, 259, 402, 405–407, 413, 416, 419, 425, 441, 458
  accessory, 405–406
  median, 406
Cerebellar artery
  inferior
    anterior, 147, 149–152, 154, 159, 176
    posterior, 147, 149–150, 152, 154, 176
    tonsillar branch of posterior, 154
  superior, 147, 149–152, 154, 176
    imaging of, BP32, 159
Cerebellar hemispheric veins, inferior, 155
Cerebellar notch
  anterior, 126
  posterior, 126
Cerebellar nuclei, 126
  dentate of, 126
  emboliform of, 126
  fastigial, 126
  globose of, 126
Cerebellar peduncle, 125
  inferior, 124–126, 135
  middle, 124–126
    imaging of, BP32, 160
  superior, 124–126
    decussation of, 126
Cerebellar vein
  precentral, 155
  superior, 155
Cerebellomedullary cistern, posterior, 120
Cerebellum, BP35, 110, 117, 122, 125–126, 157
  anterior lobe of, 126
  biventer lobule of, 126
  flocculonodular lobe of, 126
  flocculus of, 124, 126
  fourth ventricle of, 126
  horizontal fissure of, 126
  imaging of, BP32, 160
  medullary velum of
    inferior, 126
    superior, 126
  posterior lobe of, 126
  posterolateral fissure of, 126
  postlunate fissure of, 126
  primary fissure of, 126
  quadrangular lobule of, 126
  retrotonsillar fissure of, 126
  secondary fissure of, 126
  semilunar lobule of
    inferior, 126
    superior, 126
  simple lobule of, 126
  tonsil of, 126
  vermis of, 125
    central lobule of, 125
    culmen of, 125
    declive of, 125
    folium of, 125
    lingula of, 125
    nodulus of, 125
    pyramid of, 125
    tuber of, 125
    uvula of, 125
Cerebral aqueduct, T2.2, 50, 117–118, 120, 125, 128, 157–158
  imaging of, 160
Cerebral arterial circle (of Willis), T2.3, 150–151
Cerebral arteries, 113
  anterior, 147–152, 154, 156
    cingular branches of, 153
    imaging of, 31–32, 159

Cerebral arteries *(Continued)*
    left, 153
    medial frontal branches of, 152–153
    terminal branches of, 153
  middle, 147–152, 154
    branches of, 148
    imaging of, 31–32, 159
    left, 153
    occipitotemporal branches of, 153
    temporal branches of, 152
  posterior, 147–152, 154
    calcarine branch of, 153–154
    imaging of, 31–32, 159
    parietooccipital branch of, 153–154
    right, 153
    temporal branches of, 154
    terminal branches of, 153
Cerebral crus, 118, 124, 126, 150
Cerebral fissure, longitudinal, 118, 154, 156
  imaging of, 160
Cerebral hemisphere, 113
Cerebral peduncle, 50, 117, 125
Cerebral sulcus, lateral, 152
Cerebral veins
  anterior, 155–157
  inferior, 113, 115
  internal, 117, 122, 155–157
    imaging of, BP31, 159
    left, 157
    right, 157
  middle
    deep, 111, 155–157
    superficial, 111, 113, 115, 156
  superficial, 113
  superior, 113
    opening of, 112
Cerebrospinal fluid
  circulation of, 120
  radiology of, 165
  within thecal sac, BP35
Cerebrum
  frontal lobe of, 116
  frontal pole of, 116, 118
  inferior (inferolateral) margin of, 118
  occipital lobe of, 116
  occipital pole of, 116, 118
  parietal lobe of, 116
  temporal lobe of, 116
  temporal pole of, 116, 118
Cervical artery
  ascending, BP23, 40, 82–83, 87–89, 149, 176, 418
  deep, BP23, 149, 176
  superficial, 183
  transverse, BP23, 39–40, 89, 418–419
    deep branch of, BP23
    superficial branch of, BP23, 183
Cervical cardiac branch, BP40
Cervical cardiac nerves, BP39, 213, 232
  inferior, 141, 231
  middle, 141, 230–231
  superior, 76, 83, 141, 230–231
Cervical fascia, 34, 194
  deep
    prevertebral layer of, 33
    superficial layer of, 31–33, 77, 413
Cervical ganglion
  middle, 39–40, 76, 139, 141, 230–231, 243
  superior, 62, 64, 76, 136, 139, 141–145, 172, 230–231, 243
Cervical lordosis, 162
Cervical lymph nodes, 7
  anterior deep, 85
  anterior superficial, 85
  deep lateral, 86
  inferior deep lateral, 85

Cervical lymph nodes *(Continued)*
  posterior lateral superficial, 85
  superior deep lateral, 85
  superior lateral superficial, 85
Cervical muscles, deep, 33
Cervical nerve, transverse, 9, 39–40, 140
Cervical pleura, BP44, T4.1, 87
Cervical plexus, T2.2, 169, 183
  branches from, 9
  schema of, 40, 140
Cervical region
  anterior, 2
  lateral, 2
  posterior, 3
Cervical ribs, related anomalies and, BP45
Cervical spinal cord, BP35
Cervical spinal nerves, 33
  C1, 82, 138, 169–170
    anterior rootlets of, 82, 124
    posterior rootlets of, 124
    vertebrae relation to, 182
  C2, 82, 138, 170
    anterior ramus of, 39
    dermatome of, 171
    vertebrae relation to, 182
  C3, 138, 170
    anterior ramus of, 39
    dermatome of, 171
  C4, 82, 138, 170
    dermatome of, 171
    vertebrae relation to, 184
  C5, 170
    anterior ramus of, 39
    dermatome of, 171
    vertebrae relation to, 184
  C6, 170
    dermatome of, 171
    vertebrae relation to, 184
  C7, 170
  C8, 169–170
  enlargement of, 170
  groove for, 27–28
  posterior rami of, 9
Cervical spine, radiographs of, BP34
  MRI, BP35
  open-mouth, BP35
Cervical sympathetic ganglion, BP41
  superior, 68
Cervical sympathetic trunk, BP39
Cervical sympathetic trunk ganglion, 232
Cervical vein, deep
  left, 179
  right, 179
Cervical vertebrae, T2.1, 162, 217
  anulus fibrosus of, 28
  arteries, 176
  body of, 27–28
  C3, 22, 26
    bifid spinous process of, 27
    costal lamella of, 27
    inferior articular facet for, 26–27
    inferior articular process of, 27–28
    inferior aspect of, 27
    lamina of, 27
    pedicle of, 27
    superior articular process of, 28
    transverse foramen of, 27
    transverse process of, 27
      tubercles of, 37
    vertebral body of, BP18, 27
    vertebral foramen of, 27
  C4, 26–27
    anterior view of, 27
    articular surface of, 27
    body of, 27

Cervical vertebrae *(Continued)*
    groove for spinal nerve, 27
    inferior articular facet of, 27
    inferior articular process of, 27
    lamina of, 27
    left uncinate process of, 27
    spinous process of, 27
    superior articular facet of, 27
    superior articular process of, 27
    superior aspect of, 27
    transverse foramen of, 27
    transverse process of, 27
    uncinate process of, 27
    vertebral body of, 27
  C6
    anterior tubercle of, 29
    transverse process of, 147
  C7, BP18, 22, 27, 169
    anterior view of, 27, 162
    articular surface of, 27
    body of, 27
    costal lamella of, 27
    inferior articular process of, 27
    lamina of, 27
    lateral view of, 162
    pedicle of, 27
    posterior view of, 162
    septated transverse foramen of, 27
    spinal nerve of, groove for, 27
    spinous process of, 27, 29, 161, 180, 413
    superior articular process and facet of, 27
    superior view of, 27
    transverse process of, 27
      posterior tubercle of, 37
    uncinate process of, 27
      articular surface of, 27
    vertebral body of, 27
    vertebral foramen of, 27
  degenerative changes in, BP18
  intervertebral disc of, 28
  nucleus pulposus of, 28
  transverse foramen of, 28
  transverse process of, 28
  uncinate processes of, 28
  uncovertebral joints of, 28
  upper, 26
Cervicofacial division, 54
Cervicothoracic (stellate) ganglion, BP39, 141, 213, 230–231, 243
Cervix, T6.1, 354, 397
  of uterus, 345–347, 353, 355–356
Chest scans, axial CT images, 244
Chiasma, BP91
Chiasmatic cistern, 120
Choanae, BP29, 17, 23, 43, 45, 56, 67, 75, 79
Cholinergic synapses, BP41
  schema of, BP41
Chorda tympani, BP27, 59–60, 82, 106–107, 133, 135, 142, 144–145
Chordae tendineae, 224–225, 227
Choroid, 100, 103
Choroid plexus, 122–123, 125
  of third ventricle, 117
Choroid vein, superior, 156–157
Choroidal artery
  anterior, 148, 150–152, 154
  posterior lateral, 150, 154
  posterior medial, 150
Ciliary arteries
  anterior, 103–104
    recurrent branch of, 104
  posterior, 99
    long, 103–104
    short, 103–104
Ciliary body, 100–103
  blood vessels of, 103
  orbiculus ciliaris of, 102
Ciliary ganglion, BP40, 61, 64, 97–98, 132–133, 142–143, 173
  branch to, 132–133, 143
  oculomotor root of, 143
  parasympathetic root of, 97, 132, 142
  schema of, 143
  sensory root of, 97, 142
  sympathetic root of, 97, 132, 142–143
Ciliary muscle, T2.4, 100, 132, 143
  circular fibers of, 101
  meridional fibers of, 101
Ciliary nerves
  long, 61, 97–98, 132–133, 142–143
  short, 61, 97–98, 132–133, 142–143
Ciliary process, 100–102
Ciliary vein, anterior, 101, 103–104
Cingulate gyrus, 117
  isthmus of, 117–118
Cingulate sulcus, 117
Circular esophageal muscle, 239
Circular folds (valves of Kerckring), 279, 287
Circular intramuscular plexus, 308
Circular muscle, BP54, 375–376
Circulation, prenatal and postnatal, 233
Circumflex fibular branch, BP108, BP110, 503
Cisterna chyli, 7, 268, 300, 325
Claustrum, 121
Clavicle, BP34, BP57, T7.1, 4–5, 8, 31–32, 34–36, 38, 187–188, 191, 193–196, 202–204, 217, 221, 234–235, 245, 402, 408–416, 418–419, 470
  acromial end of, 408
  acromial facet of, 408
  conoid tubercle, 408
  sternal articular surface of, 408
  sternal end of, 408
Clavicular head. *See also* Pectoralis major muscle
  of sternocleidomastoid muscle, 8
Clavipectoral fasciae, 194, 416
Clinoid process
  anterior, 14–15, 18, 98
  posterior, 18
Clitoral artery, 361
  internal, 386
Clitoris, 360–361, 377
  body of, 345, 370
  crus of, 345, 352–353, 356, 360–361
  deep artery of, 361, 386
  deep nerve of, 361
  dorsal artery of, 386
  dorsal nerve of, 395–396, 487
  dorsal vein of, deep, 339–341, 345, 347, 350, 361
  frenulum of, 358
  glans of, 358, 370
  prepuce of, 356, 358
  suspensory ligament of, 359–361
Clivus, BP35, 18, 30
  imaging of, 160
Clunial nerves
  inferior, 183, 393, 395, 474, 492–493, 531
  medial, 474, 492
  middle, 183
  superior, 183, 474, 492
CN I. *See* Olfactory nerve (CN I)
CN II. *See* Optic nerve (CN II)
CN III. *See* Oculomotor nerve
CN IV. *See* Trochlear nerve (CN IV)
CN V. *See* Trigeminal nerve
CN VI. *See* Abducens nerve (CN VI)
CN VII. *See* Facial nerve
CN VIII. *See* Vestibulocochlear nerve (CN VIII)
CN IX. *See* Glossopharyngeal nerve
CN X. *See* Vagus nerve
CN XI. *See* Accessory nerve (CN XI)
CN XII. *See* Hypoglossal nerve (CN XII)
Coccygeal cornu, 166
Coccygeal nerve, 169–170, 489
Coccygeal plexuses, 487, 489
Coccygeus muscle, T6.1, T6.3, 265, 339–343, 384–385, 392–394
  nerve to, 487, 489
Coccyx, BP4, BP109, 166–167, 169–170, 250, 334, 337–340, 360, 373
  anterior view of, 162
  lateral view of, 162
  measurements of, 336
  posterior view of, 162
  tip of, 341, 343, 362, 364, 377, 400
  transverse process of, 166
Cochlea, BP28, 64, 108, 110
  course of sound in, 105
  duct of, BP28
  helicotrema of, BP28, 105, 108–109
  modiolus of, 109
  scala tympani of, BP28, 105
  scala vestibuli of, BP28, 105
  section through turn of, 109
Cochlear aqueduct, 109
Cochlear cupula, 108
Cochlear duct, 108–110
Cochlear nerve, BP28, 105, 108–110, 135
Cochlear nucleus, 135
  anterior, 127–128, 135
  posterior, 127–128, 135
Cochlear recess, 108
Cochlear (round) window, BP28, 21, 105, 108
  fossa of, BP27, 106
Cochlear (spiral) ganglion, 135
Cockett's veins. *See* Perforating veins
Colic artery
  ascending branch, 380
  descending branch, 380
  left, 266, 294–295, 300, 305, 316, 380
  middle, 288, 291, 294–295, 304, 324
  right, 294–295, 316
  variations in, 73–74
Colic flexure
  left, splenic, 270, 272–273, 276, 278, 283, 323
  right, hepatic, 270, 272–273, 276, 278, 283, 285, 318
Colic impression, 284
Colic nodes, right, BP82
Colic vein, 297
  left, 298–299
  middle, 298–299
  right, 298–299
Collagen
  in arterial wall, BP16
  fibers, in connective tissues and cartilage, BP6
  lamellae of anulus fibrosus, 168
Collar of Helvetius, 239
Collateral artery
  middle, BP100, 422, 424–425
  radial, BP100, 422, 424–425
Collateral eminence, 122
Collateral ligament, BP106, 448, 454
  accessory, 448
  of ankle, medial, 505
  fibular, 497–502, 505, 508–510, 512
  of foot, 519
  medial, T8.1
  radial, BP102, 428
  tibial, 497–500, 502, 505, 508–509, 511
  ulnar, BP102, 428
Collateral sulcus, 117–118
Collateral trigone, 122
Collecting vessels
  apical, 86
  basal, 86
  central, 86
  marginal, 86

Colles' fascia, BP88, BP90, 352–353, 359–365, 373, 377–378, 386–387, 393
- superficial, 349

Colliculus
- facial, 125
- inferior, 117, 122, 124–125
  - brachium of, 122
  - left, 155
- superior, T2.2, 117–118, 122, 124–125, 127, 143, 154
  - brachium of, 122
  - left, 155

Colon, T5.1
- air within, 217
- area for, 311
- ascending, 137, 270, 272, 278, 311, 330, 344, 348
  - as site of referred visceral pain, BP13
- circular muscle, 281
- descending, BP85, 271, 278, 283, 311, 327, 330–331, 344, 348, 392
  - innervation to, 172
- sigmoid, 344, 346, 348, 356, 373–376, 392, 394
  - innervation to, 172
  - as site of referred visceral pain, BP13
- splenic flexure of, 282
- transverse, 270–272, 274, 278, 283, 287–289, 295, 297, 330–331

Column system, posterior, BP43

Commissure, BP43
- anterior, 117, 125, 130, 157–158
- of lips, 8
- posterior, 117, 122, 125, 370
- of semilunar valve cusps, 227

Common bony limb, 109

Common iliac arteries, BP38

Common iliac nodes, 268, 319

Common membranous limb, 108–109

Common tendinous ring (of Zinn), BP26, 96–97, 132

Communicating artery
- anterior, 147–153
  - imaging of, 31–32, 159
- posterior, 115, 147–154
  - imaging of, 31–32, 159

Communicating vein, BP42, 38, 179

Compressor urethrae muscle, T6.3, 339, 351, 360–361, 386

Concha, inferior, 23

Condylar canal, 17, 20

Condylar fossa, 17

Condylar process
- head of, BP24
- of mandible, 24
  - head of, 13

Condyles
- of femur
  - lateral, 479, 498–501
  - medial, 479, 499–501
- of fibula
  - lateral, 505
  - medial, 505
- of knee
  - lateral, BP112
  - medial, BP112
- mandibular, 14
- occipital, 15, 17–18, 23, 37
- of tibia
  - lateral, 484, 504, 510
  - medial, 498

Cone of light, 106

Cones, 131

Confluence of sinuses, 110, 114–115, 155–156
- imaging of, 159

Conjoined longitudinal muscle, 343, 376

Conjoint tendon, 262–263

Conjunctiva, 104

Conjunctival fornix
- inferior, 94
- superior, 94

Connective tissues, BP6
- dense, BP6
- layer of, in hair follicle, BP1
- of skull, 113

Conoid ligament, 408, 412, 415

Conoid tubercle, 408

Conus arteriosus, BP51, 216, 224–226

Conus elasticus, 91–92

Conus medullaris, T3.1, 169–170
- radiology of, 165

Cooper's ligament, 188. *See also* Pectineal ligament (Cooper's)

Coracoacromial ligament, 412, 415, 417, 421

Coracobrachialis muscle, T7.3, 246–247, 409, 414, 417, 419, 421, 423, 425, 463, 465

Coracobrachialis tendon, 414, 417

Coracoclavicular ligament, 408, 412, 415

Coracohumeral ligament, 412

Coracoid process, 194–195, 409–412, 414–419, 421, 423, 470
- of scapula, 192

Cornea, BP26, 94, 100–101, 103–104

Corneoscleral junction, 94

Corniculate cartilage, 90

Corniculate tubercle, 75, 79, 91

Corona radiata, BP95

Coronal plane, 1

Coronal sulcus, 370

Coronal suture, BP17, 11–16, 21

Coronary arteries, 41–42, 222
- imaging of, 223
- left, 222–223
  - anterior interventricular branch of, BP52, 216, 222
  - anterior interventricular sulcus of, BP51, 216
  - circumflex branch of, BP52, 222–223, 226
  - interventricular septal branches of, BP52, 223
  - left (obtuse) marginal branch of, BP52, 223
  - opening of, 227
  - posterior left ventricular branch of, 222
  - posterolateral branches of, 227
- opening of, 228
- right, BP51, 216, 218, 222–223, 226
  - anterior oblique views with arteriograms, BP52
  - atrial branch of, 222
  - AV nodal branch of, BP52, 223, 226
  - interventricular septal branches of, 218, 222–223
  - opening of, 227
  - posterior interventricular branch of (posterior descending artery), 223, 226
  - right (acute) marginal branch of, BP52, 223
  - SA nodal branch of, BP52, 223
- variations of, BP53

Coronary ligament
- hepatorenal portion of, 284
- of liver, 275, 284, 324

Coronary sinus, BP56, 218–220, 222, 225, 248
- opening of, 221, 224, 227
- valve (thebesian) of, 224

Coronary sulcus, BP51, 216, 218

Coronoid fossa, 409, 426

Coronoid process, 60, 429, 433
- of mandible, 13–14, 24

Corpora cavernosa, of penis, 364

Corpus albicans, BP95, 355

Corpus callosum, 117, 122, 152, 154
- body of, imaging of, BP32, 160
- dorsal vein of, 155, 157
- genu of, 117–118, 121, 123, 157
  - imaging of, 160

Corpus callosum *(Continued)*
- right dorsal branch to, 154
- rostrum of, 117, 152, 156
  - imaging of, 160
- splenium of, 117–118, 121, 123, 125, 154–157
  - imaging of, 160
- sulcus of, 117
- trunk of, 117, 152

Corpus cavernosum, 349, 363, 365, 367

Corpus hemorrhagicum, BP95

Corpus luteum, BP95, BP92, 355

Corpus spongiosum, BP93, 349, 352, 363–364, 367

Corpus striatum, 152

Corrugator cutis ani muscle, 375–376

Corrugator supercilii muscle, T2.4, BP20, 31, 42, 134

Cortex, BP95
- of kidney, 314

Cortical bone, BP7

Cortical lymph vessels, 319

Corticospinal tract, anterior, BP43

Costal cartilages, 191, 193, 202, 250, 328, 408
- fifth, 200
  - left, 220
- second, 247
- seventh, BP44, 204
- sixth, BP44, 413

Costal facet, 163
- inferior, 163, 193
- superior, 163, 193
- transverse, 163, 193

Costal groove, 193

Costal impressions, 284

Costal pleura, 235–236

Costocervical trunk, BP23, 40, 147, 149, 179

Costochondral joints, 193

Costoclavicular ligament, 193, 408, 416

Costocoracoid ligament, 416

Costocoracoid membrane, 416

Costodiaphragmatic recess, BP56, 204, 221

Costomediastinal space, 204

Costotransverse joint, 245

Costotransverse ligament, BP33, 193
- lateral, BP33, 193
- superior, 193

Costoxiphoid ligament, 193

Cough receptors, 214

Cowper's gland, BP93, 349, 352, 365–367, 371. *See also* Bulbourethral (Cowper's) gland
- primordium, 371

Coxal bone, BP4, 476

Cranial, as term of relationship, 1

Cranial base
- foramina and canals of
  - inferior view of, 19
  - superior view of, 20
- inferior view of, 17
- nerves of, 64
- superior view of, 18
- vessels of, 64

Cranial cavity, BP3

Cranial fossa
- anterior, 18
- middle, 18
  - floor of, BP24
- posterior, 18
  - arteries of, 154
  - veins of, 155

Cranial imaging, BP31, 159–160

Cranial nerves
- motor and sensory distribution of, 129
- nuclei of, in brainstem, 127–128

Cranial root, 137

Craniocervical ligaments
- external, 29
- internal, 30

Cranium, BP4
Cremaster fascia, 369, 372
Cremaster muscle, BP59, T6.3, 254, 260, 263, 369
  lateral origin, BP58, 253
  medial origin, BP58, 253, 262
Cremasteric artery, 258, 264
Cremasteric fascia, BP59, 263
Cremasteric vessels, 263, 383
Cribriform fascia, within saphenous opening, 475
Cribriform hymen, BP96
Cribriform plate, 15, 18, 46
  foramina of, 20
Cricoarytenoid muscle
  lateral, T2.5, 91–92
    action of, 93
  posterior, T2.7, 75, 80, 91–92
    action of, 93
Cricoesophageal tendon, 80
Cricoid cartilage, 21–22, 32, 35, 77–78, 81, 87, 90–92, 202, 208, 210, 237–238
  arch of, 90
  arytenoid articular surface of, 90
  lamina of, 80, 90–91
  posterolateral surface of, 238
  prominence over lamina of, 79
Cricopharyngeal muscle, 34, 75, 78, 81, 88–89, 92
Cricothyroid artery, 83, 87
Cricothyroid joint, 90, 93
Cricothyroid ligament, 87
  lateral, 90
  median, 35, 78, 81, 87, 90, 208
Cricothyroid muscle, T2.4, 35, 81, 87, 91–92, 137
  action of, 93
  oblique part of, 91
  straight part of, 91
Crista galli, 15, 18
  imaging of, 160
Crista terminalis, 224, 229
Crossing over, BP91
Cruciate ligaments, 30, 498, 505
  anterior, T8.1, 499–500
  covered by synovium, BP114
  posterior, 499–500
Crura, of respiratory diaphragm, 185
Crural artery
  anterior, 107
  posterior, 107
Crural fascia, 473, 475, 513–514
Crus of diaphragm, BP38
Crypt, 71
Crypts of Lieberkühn, BP62
Cubital fossa, 402
Cubital region, 2
Cubital vein, median, T7.2, BP99, 405, 407
Cuboid bones, 515–516, 518, 527–528, 535
  articular surface for, 517
  tuberosity of, 519, 527
Cuboidal cells, BP95
Cuboideonavicular ligament
  dorsal, 518
  plantar, 519
Cumulus oöphorus, BP95
Cuneate fasciculus, BP43
Cuneate tubercle, 124–125
Cuneiform bones, 515–516, 527–528
  medial, BP117, 518, 527
Cuneiform tubercle, 75, 79, 91
Cuneocuboid ligament, dorsal, 518
Cuneonavicular ligaments
  dorsal, 518
  plantar, 519
Cuneus, 117
  apex of, 118
Cutaneous nerves, BP1
  brachial
    medial, 259
    superior lateral, 183
  dorsal
    intermediate, BP115, 533
    lateral, BP115, 473–474, 521, 531–533
    medial, BP115, 533
  femoral
    anterior, 529
    lateral, 264, 269, 311, 391, 473–475, 486–488, 490–491, 496, 529–530
    posterior, 169, 183, 395, 474, 487, 489, 492–493, 496, 531
  of head, 9
  of neck, 9, 38
  perforating, 393, 395, 474, 487, 489, 493
  sural
    lateral, 473–474, 492, 507–508, 514, 531–533
    medial, BP111, 474, 492, 507–508, 514, 531–532
Cutaneous vein, femoral, anterior, BP107
Cuticle, BP1
Cystic arteries, T5.2, 287, 290–291
  variations in, BP69
Cystic duct, 284, 287–288, 290–291
  variations in, BP68
Cystohepatic trigone (of Calot), 287, 291
Cystourethrograms, BP89

D

Dartos fascia
  of penis, 349, 362–364, 369
  of scrotum, BP88, 349, 362, 369, 372, 377, 387
Deep artery
  of clitoris, 386
  of penis, 363, 365, 387
Deep (Buck's) fascia
  of penis, 252–254, 324, 349
  of thigh, 362–363
Deep cervical artery, 176
Deep cervical lymph nodes, inferior, 212, 242
Deep cervical lymphatic chain, T2.3
Deep cervical vein, BP42
Deep fascia, of hand, 457
Deep vein of thigh, BP107
Deeper membranous layer, 359
Deltoid ligament. *See also* Collateral ligament
  tibiocalcaneal part of, BP116
Deltoid muscle, T7.3, 32, 36, 161, 180, 183, 187, 221, 245–247, 402, 408–410, 413–414, 416–417, 419, 421–423, 425, 463, 468, 470
Deltoid region, 3
  anterior, 2
Deltoid tuberosity, 409–410
Deltopectoral groove, 402
Deltopectoral triangle, 413
Dendrite, BP11
Denonvilliers' fascia, 343, 349, 366, 373, 378. *See also* Rectoprostatic (Denonvilliers') fascia
Dens, BP5, BP42, 30
  abnormalities of, BP19
  apical ligament of, BP19, 30, 77–78
  of atlas, 26
  of axis, 12, 14, 26, 28
  posterior articular facet of, 30
Dental plexus, inferior, 133
Dental pulp, 74
Dentate gyrus, 117, 119, 122–123, 130
Dentate line, 375. *See also* Pectinate (dentate) line
Dentate nucleus, 125
Denticulate ligament, 174, 177
Dentine, of teeth, 74
Depressor anguli oris muscle, T2.4, 20–21, 31, 55, 134
Depressor labii inferioris muscle, T2.4, 20–21, 31, 55, 134
Depressor septi nasi muscle, T2.4, BP20, 31, 42, 134
Dermal papilla, 1–2
Dermatomes, 171
  levels of, 171
  schematic demarcation of, 171, 472
  of upper limb, 403
Dermis, BP1
Descemet's membrane, 101
Descending aorta. *See* Thoracic aorta
Descending colon, 173, 344, 348, 392
Descending fibers, 321, 399
Desmosome, BP16
Detrusor muscle, of bladder wall, BP90
Diagonal conjugate, 336
Diaphragm, BP57, 392. *See also* Respiratory diaphragm
  central tendon of, 235
  silhouette, BP36
Diaphragmatic constriction, 237
Diaphragmatic ligament, 368, 371. *See also* Suspensory (diaphragmatic) ligament
Diaphragmatic recess, right, 217
Digastric fossa, 24
Digastric muscle, T2.4, 75
  anterior belly of, BP22, 34–36, 38, 41, 50, 53, 59, 69, 81
  intermediate tendon of, 70
  mastoid notch for, 17
  phantom, 41
  posterior belly of, 32, 35–36, 41, 53, 57, 59, 68–70, 75, 81, 86, 134
Digastric tendon, intermediate, 68
  fibrous loop for, 32, 35, 69–70
Digestive system, T6.1, T5.1
Digestive tract, BP10
Digital arteries
  dorsal, BP110, BP115, 459–461, 503, 512, 521, 527
  palmar, BP101, 424, 449
    common, BP101, 424, 450, 453, 455–456
    proper, BP101, 450, 456, 459–461
  proper, 424
    plantar, branches of, 512
Digital fibrous sheaths, 448
Digital nerve
  dorsal, 406, 458, 460–461, 473, 511
    of foot, 533
    lateral, 473
  palmar, 406, 449–450
    common, 456, 466–467
    proper, 450, 456, 458–460, 466–467
  proper plantar, branches of, 512
Digital vein
  dorsal, 406, 473
  palmar, BP99, 406
    dorsal, 458
Digits
  extensors of, 431
  flexors of, 433
Dilator pupillae muscle, T2.1, T2.4, 101, 132, 143
Diploë, 16
Diploic vein, 111, 113
  anterior temporal, 111
  frontal, 111
  occipital, 111
  posterior temporal, 111
Direct vein, lateral, 156–157
Distal, as term of relationship, 1
Distal interphalangeal (DIP) joint, BP102, 402, 447–448

- **Dorsal arteries**
  - of clitoris, 386
  - of penis, 363, 365, 383
    - deep, BP98
- **Dorsal interossei muscle**, T8.3
- **Dorsal nerves**
  - of clitoris, 395
  - of penis, 363, 365, 387, 391–393, 395, 398
- **Dorsal plane**, 1
- **Dorsal rami, spinal**, 174
- **Dorsal root**, BP38
- **Dorsal veins**
  - deep
    - of clitoris, 339–341, 345, 347, 350, 361
    - of penis, BP98, 342–343, 349, 365, 383, 385, 387
  - superficial, of penis, BP98, 333, 363, 385
- **Dorsal venous arch**, BP107
- **Dorsal venous network**, 406
- **Dorsalis pedis artery**, BP117, 4, 512, 527
  - foot, proximal, T8.2
  - pulses at, 4
- **Dorsiflexion, of lower limbs movements**, 472
- **Dorsolateral fasciculus**, BP43
- **Dorsum**, 443
  - of foot, 3, 522
  - of hand, 3
- **Duct of gland**, 71
- **Duct systems, of liver**, 285
- **Ductuli efferentes testis**, BP93
- **Ductus arteriosus**, 233
- **Ductus (vas) deferens**, BP93, T6.2, BP98, BP59, BP109, 256, 262, 264, 266, 348–349, 352, 366, 368–369, 371–373, 385, 391–392, 398, 475
  - ampulla of, BP93, 366
  - arteries of, BP98, 266, 369, 380, 383, 385
  - covered by peritoneum, 263
- **Ductus reuniens**, 109
- **Ductus venosus**, 233
- **Duodenal bulb**, 277, 279
- **Duodenal flexure**
  - inferior, 279
  - superior, 279
- **Duodenal fossa**
  - inferior, 271
  - superior, 271
- **Duodenal impression**, 284
- **Duodenal papilla**
  - major, 287
  - minor, 279, 287
- **Duodenal wall, layers of**, BP61
- **Duodenojejunal flexure**, 271, 278–279, 288, 318, 323
- **Duodenojejunal fold**, 271
- **Duodenojejunal junction**, 185
- **Duodenomesocolic fold**, 271, 278
- **Duodenum**, BP62, T5.1, 137, 271, 274–276, 284–285, 311, 316, 318, 323, 326–327
  - arteries of, 291, 293
  - ascending part of, 271, 278
  - autonomic innervation of, 301–303
  - descending part of, 185, 271, 273, 278–279
  - inferior part of, 271, 278
  - longitudinal muscle of, 278, 287
  - as site of referred visceral pain, BP13
  - in situ, 278
  - superior part of, 278, 287, 329
  - suspensory muscle of, 271
  - veins of, 296
- **Dura mater**, BP35, BP42, 45, 106, 109, 111–112, 120, 130, 177, 179
  - endostial layer of, 113
  - meningeal layer of, 113
  - radiology of, 165
  - spinal, 169, 185
- **Dura-skull interface**, 111, 113
- **Dural sac, termination of**, 165
- **Dural venous sinuses**, T2.3
  - sagittal section of, 114
  - superior view of, 115

E

- **Ear**
  - ampulla of, 108–109
  - bony and membranous labyrinths of, 108–109
  - course of sound in cochlea and, 105
  - external, 106
  - pediatric, anatomy of, BP28
  - vestibule of, 108–109
- **Ear ossicles**, T2.1
- **Edinger-Westphal nucleus**. *See* Accessory oculomotor nucleus
- **Efferent ductules**, 371–372
- **Ejaculatory ducts**, BP97, 366–367, 371
  - in prostatic urethra, 400
- **Elastic fibers**, BP1, BP6
- **Elastic membrane, of arterial wall**
  - external, BP16
  - internal, BP16
- **Elbow**
  - anterior region of, 2
  - bones of, 426–441
  - ligaments of, 428
  - posterior region of, 3
  - radiographs of, 427
- **Elliptical recess**, 108
- **Emissary vein**, 20, 111, 113
  - condylar, 179
  - mastoid, 10, 111, 179
    - in mastoid foramen, 19
  - occipital, 111
  - parietal, 10, 111
- **Enamel, of teeth**, 74
- **Endocrine system**, T4.1, T5.1, BP10
- **Endolymphatic duct**, 20, 108
- **Endolymphatic sac**, 109
- **Endometrium, of uterus**, 379
- **Endomysium**, BP8
- **Endoneurium**, BP12
- **Endopelvic fascia**, T6.1, 347
  - deep perineal pouch with, BP88
  - paravesical, 352
- **Endosteal surface**, BP7
- **Endothelial cell**, BP6
- **Endothelium, of arterial wall**, BP16
- **Eosinophils**, BP15, BP6
- **Epicolic nodes**, BP82
- **Epicondyles**
  - of femur
    - lateral, 479, 483, 498
    - medial, 479, 492, 497–498
  - of knee, medial, BP112
- **Epicranial aponeurosis**, BP20, 10, 31, 113, 184
- **Epicranius muscle**
  - frontal belly (frontalis) of, 20–21
  - occipital belly (occipitalis) of, T2.6
- **Epidermis**, 1–2
- **Epididymal duct**, 372
- **Epididymis**, BP93, 368–369, 371–372, 398
  - appendix of, 369, 371
  - body, 372
  - head, 372
  - sinus of, 369
  - tail, 372
- **Epidural fat**, BP42
  - radiology of, 165
- **Epidural space, fat in**, 177
- **Epidural venous plexus**. *See* Internal vertebral venous plexus, anterior
- **Epidural vertebral venous plexus**. *See* Internal vertebral venous plexus, anterior
- **Epigastric artery**
  - inferior, BP59, BP108, 266–268, 317, 347, 380, 382, 503
    - cremasteric branches of, 256, 266
    - pubic branches of, 256, 266, 348
  - superficial, BP108, 254, 258, 266, 503
  - superior, 194–197, 215, 258–259
- **Epigastric node, inferior**, 268
- **Epigastric region**, 251
- **Epigastric veins**
  - inferior, 259, 267, 382
  - superficial, BP107, 259, 267, 333, 473
  - superior, 196, 198
- **Epigastric vessels**
  - inferior, BP98, 254, 256, 262, 264, 344, 348, 356, 383, 385
    - pubic branches of, 262
  - superficial, BP58, 252, 254
  - superficial circumflex, 490
- **Epiglottis**, BP44, 22, 71–72, 75, 77, 79–80, 89–92, 146, 237
- **Epimysium**, BP8
- **Epineurium**
  - inner, BP12
  - outer, BP12
- **Epiphyseal plate**, 495
- **Epiphysis**, 460–461
  - nutrient branch to, 460–461
- **Epiploic appendices**. *See* Omental (epiploic) appendices
- **Episcleral artery**, 103
- **Episcleral space**, BP26, 100
- **Episcleral vein**, 103–104
  - segment of, 104
- **Epithelial cord**, BP95
- **Epithelial tag**, 370
- **Epithelium**
  - gingival, 74
  - superficial, germinal, BP95
- **Epitympanic recess**, 27–28, 105–106
- **Eponychium**, 460–461
- **Epoöphoron**, 371
- **Erector spinae muscle**, T3.2, BP85, 161, 180, 182, 186, 197, 245, 261, 312
- **Esophageal artery**, 211
- **Esophageal hiatus**, 201
- **Esophageal impression**, 284
- **Esophageal mucosa**, 80, 239
- **Esophageal muscle**, 77, 208
  - circular, 75, 78, 80, 239
  - longitudinal, 75, 78, 80, 88, 239
    - cricoid attachment of, 75, 78
- **Esophageal plexus**, 39–40, 137, 210, 213, 220, 234–236, 243, 303
  - sympathetic branch to, 213
- **Esophageal prominence**, 219
- **Esophageal submucosa**, 80
- **Esophageal veins**, T5.2, 241, 299
- **Esophagogastric junction**, 221, 239, 328–332
  - cross-sectional anatomy, 328–332
- **Esophagus**, BP56, BP44, BP9, 33–34, 76–77, 79, 81, 89, 91, 137, 200, 210–211, 220–221, 234–235, 237, 241, 243–248, 265, 267–268, 271, 305, 311, 324
  - abdominal part of, 236–237, 240, 276
  - air within, BP36
  - arteries of, 240
    - variations in, BP55
  - autonomic innervation of, 303
  - cervical part of, 236, 240
  - longitudinal muscle of, 277
  - lung area for
    - left, 205
    - right, 205
  - lung groove for
    - left, 205
    - right, 205

- **Esophagus** *(Continued)*
  - lymph vessels and nodes of, 242
  - musculature of, 238
  - nerves of, 243
    - variations in, intrinsic and, BP54
  - recurrent branch of, 201, 266
  - in situ, 236
  - thoracic part of, 236, 240
  - topography and constrictions of, 237
  - veins of, 241
  - ventral surface of, bare are on, 238
- **Estrogen**, BP92
- **Ethmoid bone**, 11, 13, 15, 18, 44–45
  - anterior ethmoidal foramen of, 21
  - cribriform plate of, 15, 18, 43–45, 130
  - crista galli of, 15, 18, 45
  - nasal concha of
    - highest, 44
    - middle, 11, 15, 44
    - superior, 15, 44
  - of newborn, 21
  - orbital plate of, 11, 13, 21
  - perpendicular plate of, 11, 15, 45
  - uncinate process of, 44, 52
- **Ethmoid sinus, imaging of**, 160
- **Ethmoidal artery**
  - anterior, 20, 99
    - anterior meningeal branch of, 112
  - posterior, 20, 99, 112
    - lateral nasal branch of, 47
    - septal nasal branch of, 47
- **Ethmoidal bulla**, 43–44
- **Ethmoidal cells**, BP26, BP22, 50–51
  - anterior, 98
  - middle, opening of, 43–44
  - posterior, openings of, 44
- **Ethmoidal foramen**
  - anterior, 20
  - posterior, 20
- **Ethmoidal nerve**
  - anterior, 20, 61, 97–98, 132–133
    - external nasal branch of, 9, 46, 48, 61
    - lateral internal nasal branch of, 46
    - medial internal nasal branch of, 46, 98
  - posterior, 20, 61, 97–98, 132–133
- **Ethmoidal sinus**, 12
- **Ethmoidal vein**
  - anterior, 20
  - posterior, 20
- **Eustachian tube**. *See* Auditory tube
- **Eversion, of lower limbs movements**, 472
- **Extension, of lower limbs movements**, 472
- **Extensor carpi radialis brevis muscle**, T7.3, 402, 422, 431, 434–435, 439–441, 468–469
- **Extensor carpi radialis brevis tendon**, 434–435, 441, 457, 459–460
- **Extensor carpi radialis longus muscle**, T7.3, 402, 409, 422, 425, 431, 434–435, 439–441, 468–469
- **Extensor carpi radialis longus tendon**, 434–435, 441, 457, 459–460
- **Extensor carpi ulnaris muscle**, T7.3, 402, 422, 431, 434, 439–441, 468–469
- **Extensor carpi ulnaris tendon**, 434–435, 441, 459–460
- **Extensor digiti minimi muscle**, T7.4, 431, 434, 439–441, 469
- **Extensor digiti minimi tendon**, 434–435, 441, 459–460
- **Extensor digitorum brevis muscle**, T8.3, 510, 512, 520, 527, 533
- **Extensor digitorum brevis tendon**, 511–512, 522
- **Extensor digitorum longus muscle**, BP116, BP111, T8.3, 484, 498, 506, 510–512, 514, 520, 533
- **Extensor digitorum longus tendon**, 116–117, 471, 510–512, 521, 527
  - tendinous sheath of, 521
- **Extensor digitorum muscle**, T7.4, 422, 431, 434, 439–441, 468–469
- **Extensor digitorum tendon**, 105–106, 402, 434–435, 441, 459–460
- **Extensor expansion**, 105–106, 454, 460
  - system, 521, 527
- **Extensor hallucis brevis muscle**, BP117, T8.3, 512, 521, 533
- **Extensor hallucis brevis tendon**, BP117, 511–512, 522, 527
- **Extensor hallucis longus muscle**, BP116, BP111, T8.3, 506, 510–512, 514, 522, 533
- **Extensor hallucis longus tendon**, 116–117, 471, 510–512, 521, 527
  - tendinous sheath of, 520
- **Extensor indicis muscle**, T7.4, 431, 435, 440–441, 469
- **Extensor indicis tendon**, 105–106, 402, 431, 434, 441, 459–460
- **Extensor pollicis brevis muscle**, T7.4, 431, 434–435, 440, 469
- **Extensor pollicis brevis tendon**, 434, 438, 441, 457, 459–460
- **Extensor pollicis longus muscle**, T7.4, 431, 435, 440–441, 469
- **Extensor pollicis longus tendon**, 402, 434, 441, 453, 457, 459–460
- **Extensor retinaculum**, 406, 434–435, 457–460
  - inferior, 510–511, 520, 533
  - superior, BP116, 510–511, 520
- **Extensor tendon**, 453–454
  - common, 409–410, 431, 434–435, 439
  - long, 454
- **External abdominal oblique muscle**, 484
- **External capsule**, 121
  - imaging of, 160
- **External genitalia**, 358, 362–363
  - homologues of, 370
  - nerves of
    - female, 395
    - male, 391
- **External iliac vein**, BP107
- **External oblique muscle**, 344, 348
- **External occipital protuberance**, 13–15, 17, 23, 161
- **External os**, 355
  - of uterus, 357
- **External pudendal vein**, BP107
- **External vertebral venous plexus, anterior**, BP42
- **Extrahepatic bile ducts**, 287
- **Extraperitoneal fascia**, BP59, 254, 263–264, 394
- **Extraperitoneal space**, 374
- **Extreme capsule**, 121
- **Extrinsic muscle, of eye**, 96
  - innervation of, 96
- **Eye**, 173
  - anterior chamber of, 94, 100, 102–103
  - extrinsic muscles of, 96, 103
    - innervation of, 96
  - innervation to, 172
  - intrinsic arteries and veins of, 103
  - muscles of, T2.1
  - posterior chamber of, 94, 100, 102–103
  - vascular supply of, 104
- **Eyeball**, BP22, 50
  - fasciae of, BP26
  - imaging of, 160
  - posterior chamber of, 101
  - transverse section of, 100
- **Eyelashes**, 94
- **Eyelids**, 94
  - arteries and veins of, 99
  - tarsus of, BP26

F

- **Face**, BP4
  - arterial supply sources of, 10
  - deep
    - arteries of, 63
    - nerves of, 63
  - musculature of, BP21
  - superficial arteries and veins of, 10
- **Facial artery**, 10, 38, 41–42, 49, 53, 57–58, 68, 76, 83–84, 88, 99, 142, 144, 147, 149
  - pulses at, 4
  - tonsillar branch of, 72
  - transverse, 10, 41–42, 53, 58, 83, 99
- **Facial canal**, 135
  - prominence of, BP27, 106
- **Facial colliculus**, 125
- **Facial expression, muscles of**, T2.1, 31, 68
  - anterior view of, BP20
- **Facial muscles**, 134
- **Facial nerve (CN VII)**, T2.2, BP40, 20, 27–28, 41, 49, 57, 59–60, 62, 64, 66, 68, 76, 82, 105, 107, 110, 115, 124, 128, 133–134, 142, 145–146
  - branches of, 53–54, 173
    - buccal, BP21, 54
    - cervical, BP21, 54
    - digastric, 54
    - lateral nasal, 47
    - marginal mandibular, BP21, 38, 54
    - stylohyoid, 54
    - temporal, BP21, 54
    - zygomatic, BP21, 54
  - communication to, 136
  - distribution of, 129
  - geniculate ganglion of, BP27, 127, 142
  - imaging of, BP32
  - internal genu of, 128
  - motor nucleus of, 134
  - motor root of, 135
  - proper, 54
  - schema of, 134
  - stylomastoid foramen and, 19
- **Facial nerve (CN VII) intermediate nerve**, 144
  - chorda tympani of, 19
- **Facial nodes**, 85
- **Facial nucleus**, 127–128
- **Facial vein**, 10, 38–39, 49, 53, 68, 70, 84, 99
  - common, 10, 39
  - deep, 10, 84, 99
  - transverse, 10, 84
- **Falciform ligament**, 255–256, 270, 276, 284, 299, 327
- **Fallopian tube**, 344–346, 353–356, 371, 382, 394, 397. *See also* Uterine (fallopian) tube
  - left, 356
  - right, 356
- **False ribs**, 192
- **Falx cerebri**, BP22, 45, 50, 113–115, 155
- **Fascia**
  - of hand, 453
  - of orbit and eyeball, BP26
- **Fascia lata**, 252–253, 389, 473, 475, 490, 496
  - Scarpa’s layer of, 252
  - of thigh, 353, 359, 362–363
- **Fascial sheath, lumbrical**, 450
- **Fascicle**, BP12
- **Fasciculi proprii**, BP43
- **Fasciculus**
  - cuneate, 125
  - gracile, 125
  - lateral, 125

Fasciculus *(Continued)*
  longitudinal
    dorsal, 158
    medial, BP43, 125–126
  mammillothalamic, 117
  septomarginal, BP43
Fat, BP10
Fat body, suprapatellar, 502
Fat cells, BP6
Fat pads, 235, 428
Fat tissue, 188, 401
Fatty (Camper's) fascia, BP88
Fauces, 72
Female, anterior view of, 2
Femoral artery, BP110, BP108, 4, 258, 266, 362, 400–401, 475, 483, 490, 495–496, 503
  ascending branch of, BP108
  deep, 4, 401. *See also* Profunda femoris artery
  in femoral triangle, T8.2
  lateral circumflex, BP108, 490–491, 495, 503
  medial circumflex, BP108, 491–492, 495, 503
  muscular branches of, BP108, 503
  perforating branches, 503
  pulses at, 4
  transverse branch of, BP108
Femoral canal, 475
  lymph nodes (Cloquet's), 264
Femoral cutaneous nerve
  lateral, 260, 391
  posterior, 169
    perineal branch of, 395
    posterior, 393
Femoral nerve, BP86, BP109, 169, 256, 262, 264, 269, 389, 391, 400–401, 475, 486–488, 490–491, 529–530
  anterior cutaneous branches of, 473
  anterior femoral cutaneous branches of, 391
  branches of, 496
  terminal branch of. *See* Saphenous nerve
Femoral region, BP58
  anterior, 2
  posterior, 3
Femoral ring, T5.1, 262, 264, 344, 347–348, 475
Femoral sheath, 254, 256, 264, 490
  femoral vein in, 253, 264
Femoral vein, BP86, BP107, BP58, 259, 263, 267, 362, 400, 473, 475, 483, 490, 496
  circumflex
    lateral, BP107
    medial, BP107
  deep, 5
  in femoral sheath, 253, 264
  greater, 401
  opening of, 265
Femoral vessels, 383, 389
Femur, BP113, BP4, 479, 496, 498, 501–502, 534
  adductor tubercle of, 479
  articular surface of, BP114
  body of, 479
  calcar of, 479
  condyle of
    lateral, 479, 498–501
    medial, 479, 499–501
  epicondyles of
    lateral, 479, 483, 498
    medial, 479, 492, 497–498
  gluteal tuberosity of, 479
  head of, BP109, 400, 477–479, 534
    arteries of, 495
    fovea for ligament of, 479
    ligament of, BP109, 477
    radiograph of, 335
  intercondylar fossa of, 479
  intertrochanteric crest of, 479
  intertrochanteric line of, 479
Femur *(Continued)*
  lateral supracondylar line of, 479
  linea aspera of, 479
  medial condyle of, 479
  medial epicondyle of, 479
  medial supracondylar line of, 479
  midshaft of, T8.1
  neck of, T8.1, 400–401, 477–479, 534
    arteries of, 495
  nutrient artery of, 495
  nutrient foramen of, 479
  pectineal line of, 479
  popliteal surface of, 479
  quadrate tubercle of, 479
  radiograph of, 335
  retinacular foramina of, 479
  trochanter of
    greater, BP109, 161, 334, 401, 471, 477–479, 483, 485–486, 492–493, 534
    lesser, 265, 334, 477–479, 534
    radiograph of, 335
  trochanteric fossa of, 479
Fibrin, BP95
Fibroblast, BP6
  in arterial wall, BP16
  nuclei, BP6
Fibrocartilaginous labrum. *See* Acetabular labrum
Fibroelastic membranes, of esophagus, 238
Fibrofatty tissue, 374
Fibromuscular extension, BP90
Fibromuscular stroma, 366
Fibrous appendix, of liver, 284
Fibrous capsule, BP114, BP5, 289
Fibrous pericardium, 204, 219, 235
Fibrous septum, 376
  transverse, 375
    of ischioanal fossa, 374, 376–377
Fibrous sheaths, 525–526
Fibrous trabecula, 158
Fibrous trigone
  left, 226
  right, 226
Fibula, T8.1, BP113, BP116, BP111, BP4, 501, 504–505, 510–511, 514, 517–518, 521–522, 535
  anterior border of, 504–505
  apex of, 504
  calcaneal branches of, 507
  common, 497
  condyle of
    lateral, 505
    medial, 505
  fibular notch of, 504
  head of, 482–484, 498, 500, 502, 504–505, 508–512, 533
    ligament of, 505
    posterior ligament of, 502
  inferior articular of, 504
  interosseous border of, 504–505
  lateral malleolus of, 504, 520–522
  medial crest of, 504
  medial surface of, 504
  neck of, BP112, 504
  nutrient foramen for, 504
  oblique line of, 504
  soleal line of, 504
  surface of, lateral, 504–505
Fibular artery, BP108, 4, 110–111, 503, 507–509, 513–514
  calcaneal branches of, 508
  communicating branch of, 509
  lateral calcaneal branch of, 509
  lateral tarsal branch of, BP110
  perforating branch of, BP110, 503, 509, 512, 521–522
    posterior, BP110
  posterior lateral malleolar branch of, 509
Fibular collateral ligament, 483–484
Fibular nerve
  common, BP111, T8.2, 485, 487, 489, 492, 497–498, 501, 507–512, 531–533
    sural communicating branch of, 474
  deep, BP111, 115–116, 512, 514, 521–522, 533
    dorsal digital branch of, 511–512, 521–522
    lateral branch of, 521–522, 533
    medial branch of, BP117, 511–512, 521–522, 533
    recurrent branch of, 512
  superficial, BP115, 473, 510–512, 521–522, 531, 533
    dorsal digital branches of, 521–522
    intermediate dorsal cutaneous branch, 473
    medial dorsal cutaneous branch, 473
Fibular retinaculum, 518
  inferior, 509–510, 518, 520
    fibular tendon in, 517
  superior, 507–510, 518, 520
Fibular vein, BP107, 513–514
Fibularis brevis muscle, BP111, T8.4, 506, 510–512, 514, 520, 522, 533
Fibularis brevis tendon, 507–510, 512, 522, 526–527
  common tendinous sheath of, 520
Fibularis longus muscle, BP111, T8.4, 471, 484, 497–498, 506, 508, 510–512, 514, 520, 533
Fibularis longus tendon, 507–510, 512, 522, 526–527
  common tendinous sheath of, 520
  passing to plantar region of foot, 510
Fibularis tertius muscle, BP111, T8.4, 506, 514
Fibularis tertius tendon, 510–511, 520, 522, 527
Filiform papillae, 71
Filum terminale externum, 169–170
Filum terminale internum, 169–170, 177
Fimbriae, 355
  of uterine tube, 357
Fimbriated fold, 65
Finger, 461
  extensor tendons in, 454
  fibrous tendon sheath of, 453, 460–461
  flexor tendon of, 454, 460
  flexor tendon sheath of, 450, 461
  index, 447
  little, 447
  middle, 447
  ring, 447
  tendon sheath of, 450–451, 453
Fixed retrocecal appendix, 282
Flexion, of lower limbs movements, 472
Flexor carpi radialis muscle, T7.4, 421, 423, 432, 436, 438–439, 441, 463, 466
Flexor carpi radialis tendon, 402, 437–438, 441, 444, 450, 452–453, 463
Flexor carpi ulnaris muscle, T7.4, 402, 422, 432, 434–437, 439–441, 463, 467
Flexor carpi ulnaris tendon, BP102, 402, 438, 441, 444, 450, 452, 455
Flexor digiti minimi brevis muscle, T7.4, BP117, T8.4, 452, 467, 524–527, 532
Flexor digiti minimi brevis tendon, BP117
  plantar, 519
Flexor digitorum brevis muscle, BP117, T8.4, 520, 524–525
Flexor digitorum brevis nerve, 532
Flexor digitorum brevis tendon, BP117, 524–526
  plantar, 519
Flexor digitorum longus muscle, BP111, T8.4, 506, 509, 513–514, 532

- **Flexor digitorum longus tendon**, 116–117, 507–509, 524–526
  - plantar, 519
  - tendinous sheath of, 520
- **Flexor digitorum profundus muscle**, T7.4, 433, 438–441, 463, 466–467
- **Flexor digitorum profundus tendon**, 105–106, 433, 441, 444, 448, 450–454, 460–461
- **Flexor digitorum superficialis muscle**, T7.4, 409, 433, 436–439, 441, 463, 466
- **Flexor digitorum superficialis tendon**, 105–106, 402, 433, 436, 441, 444, 448, 450–454, 460–461, 463
- **Flexor hallucis brevis muscle**, T8.4, 524–525, 532
  - lateral head of, BP117, 525–527
  - medial head of, BP117, 525–527
  - origin of, medial, 527
- **Flexor hallucis brevis nerve**, 532
- **Flexor hallucis brevis tendon, origin of, lateral**, 527
- **Flexor hallucis longus muscle**, BP116, BP111, T8.4, 506, 509, 513–514, 532
- **Flexor hallucis longus tendon**, 116–117, 507–509, 524–527
  - groove for, 517
  - plantar, 519
  - tendinous sheath of, 520
- **Flexor muscles, superficial**, 436, 514
- **Flexor pollicis brevis muscle**, T7.4, 452, 455–456, 466–467
- **Flexor pollicis longus muscle**, T7.4, 409, 433, 437–439, 441, 450, 453, 463, 466
- **Flexor pollicis longus tendon**, 105–106, 438, 444, 452–453
- **Flexor retinaculum**, BP116, 437, 444, 450, 452–453, 455–456, 463, 507–509, 513, 520, 525–526, 532
- **Flexor sheath, common**, 450–453, 456
- **Flexor tendon**, 453, 456
  - common, 409–410, 432–433, 436, 439
  - fibrous sheaths of, 524
  - sheaths, 450
  - at wrist, 452
- **Floating ribs**, 192
- **Fluid-filled follicular cavity**, BP95
- **Foliate papillae**, 71, 146
- **Follicle-stimulating hormone**, BP92
- **Follicles**
  - developing, BP95, BP92
  - stages of, BP95
- **Follicular cavity, fluid-filled**, BP95
- **Fontanelle**
  - anterior, BP17, 21
  - posterior, 21
- **Foot**
  - arteries of, 114–115, 527
  - bones of, 515
  - cross-sectional anatomy of, 115–116
  - digital nerves of, dorsal, 473
  - dorsal venous arch of, 513
  - dorsal venous network of, BP107
  - dorsum of, 3, 522
    - muscle of, 521
  - interosseous muscle of, 527–528
  - ligaments of, 519
  - muscle of sole of
    - second layer, 525–526
  - nerves of, 114–115
  - plantar region of, fibularis longus tendon passing to, 510
  - plantar surface of, 471
  - tendon of, 519
- **Foramen**
  - interventricular (of Monro), 119–120, 125, 156–157
- **Foramen** *(Continued)*
  - of Luschka, 119–120
  - of Magendie, 117, 120, 125, 128
  - transverse section through S2, 166
- **Foramen cecum**, 18, 20, 71, 77
- **Foramen lacerum**, BP29, 17, 19–20
  - recurrent artery of, 148
- **Foramen magnum**, BP29, 15, 19–20, 23, 138
  - posterior margin of, BP19
- **Foramen ovale**, BP29, 13, 17, 19–20, 23, 56, 59–60, 233
  - branch to, 148
  - valve of, 225
- **Foramen rotundum**, 12, 20, 61
  - branch to, 148
- **Foramen spinosum**, BP29, 17, 19–20, 23, 59
  - branch to, 148
- **Forearm**
  - arteries of, BP101
  - bones of, 429
  - cutaneous nerves of, 406
  - muscles of
    - anterior, T7.1
    - attachments of, 439–440
    - deep layer, 435, 438
    - extensors of wrist and digits, 431
    - flexors of digits, 433
    - flexors of wrist, 432
    - intermediate layer, 437
    - posterior, T7.1
    - rotators of radius, 430
    - superficial layer, 434, 436
  - proximal, arteries of, BP100, 424
  - radial nerve in, 469
  - serial cross sections of, 441
  - superficial veins of, 406
- **Fornix**, 117, 123, 158
  - anterior, 354
  - body of, 117, 123, 125
  - columns of, 117, 121–123, 154, 156
  - commissure of, 123
  - crus of, 117, 121, 123
- **Fossa ovalis**, 221, 224, 233
  - limbus of, 224
- **Fovea**
  - centralis, 103
  - inferior, 125
  - superior, 125
- **Free nerve endings**, BP1
- **Free taenia**, 272, 280–281, 283
- **Frenulum**, 281
  - artery to, 70
  - of clitoris, 358
  - of labia minora, 358
  - of lower lip, 65
  - of penis, 364
  - of tongue, 53, 65
  - of upper lip, 65
- **Frontal artery**, 10
- **Frontal bone**, BP17, 8, 11, 13–18, 42, 44–45, 94–95
  - anterior meningeal vessels of, groove for, 18
  - foramen cecum of, 18
  - frontal crest of, 18
  - glabella of, 11, 13
  - nasal spine of, 44–45
  - of newborn, 21
  - orbital part of, superior surface of, 18
  - orbital surface of, 11
  - sinus of, 15, 44–45
  - squamous part of, 21, 44–45
  - superior sagittal sinus of, groove for, 18
  - supraorbital notch of, 11, 13, 21
- **Frontal crest**, 16, 18, 45
- **Frontal gyrus**
  - inferior
    - opercular part of, 116
    - orbital part of, 116
    - triangular part of, 116
  - medial, 117
  - middle, 116
  - superior, 116
- **Frontal (metopic) suture**, BP17, 21
- **Frontal nerve**, BP26, 61, 97–98, 132–133, 142
- **Frontal pole, of cerebrum**, 116, 118
- **Frontal region**, 2
- **Frontal sinus**, BP22, BP44, 12, 14, 43–45, 50–51, 77
  - growth of, 52
- **Frontal sulcus**
  - inferior, 116
  - superior, 116
- **Frontal vein**, 10
- **Frontobasal artery**
  - lateral, 150, 153
  - medial, 148, 150, 152–153
- **Frontonasal canal, opening of**, 44
- **Frontonasal duct, opening of**, 51
- **Frontopolar artery**, 152–153
- **Fundic glands**. *See* Gastric (fundic) glands
- **Fundic zone**, 277
- **Fundiform ligament**, 252
  - of penis, 262, 349
- **Fundus**
  - of stomach, BP57, 237, 239, 276, 328
  - of urinary bladder, 349–350, 352
  - of uterus, 345, 355, 379
- **Fungiform papillae**, 71, 146
- **Furrow**, 71

G

- **Gallaudet's fascia**, BP90, 349, 352–353, 359–360, 363–365, 373, 377–378
- **Gallbladder**, BP62, BP87, T5.1, BP9, 137, 173, 202, 270, 273, 276, 282, 284, 287–288, 291, 327, 329
  - innervation to, 172
  - as site of referred visceral pain, BP13
- **Ganglion**, 243
  - inferior, 136, 145
  - superior, 136
  - of trigeminal nerve, 142
- **Ganglion cells**, 131
- **Gartner's duct**, 371. *See also* Mesonephric (Gartner's) duct
- **Gas exchange**, BP50
- **Gastric artery**
  - left, 240, 273, 290, 300–301, 303, 392
    - esophageal branch of, 240, 290
  - right, 279, 287, 290–291, 301–303
  - short, 290
- **Gastric folds (rugae)**, 239, 277, 328
- **Gastric (fundic) glands**, BP60
- **Gastric impression**, 284, 289
- **Gastric nodes, left**, 242
- **Gastric plexus**, 392
- **Gastric veins**
  - left, 241, 296–298
    - esophageal tributary of, 241
  - right, 241, 296–297, 299
  - short, 241, 296, 299
- **Gastric zone**, 277
- **Gastrocnemius muscle**, BP111, T8.4, 471, 481, 484–485, 492, 497–498, 506–514, 531–532
  - lateral head of, 471, 501–502
  - lateral subtendinous bursa of, 501
  - medial head of, 471, 501–502
  - medial subtendinous bursa of, 501
- **Gastrocnemius tendon**, BP116

Gastrocolic ligament, 273
  anterior layers of, 273
  posterior layers of, 273
Gastroduodenal artery, 279, 287, 291–293, 303–304, 309
Gastroduodenal plexus, 304
Gastroepiploic artery. *See* Gastroomental (gastroepiploic) artery
Gastroepiploic vessels. *See* Gastroomental (gastroepiploic) vessels
Gastroesophageal junction, T5.1
Gastrointestinal system, BP9
Gastrointestinal tract, BP41
Gastrolienal ligament. *See* Gastrosplenic (gastrolienal) ligament
Gastroomental (gastroepiploic) artery, 273, 290–291
  anastomosis of, 273
  left, 291
  plexus on, 301–302
Gastroomental (gastroepiploic) vessels, 275, 289
  left, 296
  right, 296, 298
Gastroomental vein
  left, 241
  right, 241
Gastrophrenic ligament, 273
Gastrosplenic (gastrolienal) ligament, 273–274
Gelatinous substance, BP43
Gemellus muscle
  inferior, T8.4, 395, 400–401, 480–481, 485, 492–494
    nerve to, 487, 489
  superior, T8.5, BP109, 395, 480, 492–494
    nerve to, 487, 489, 492
Gemellus tendon, superior, BP109
Genicular artery
  descending, BP110, BP108, 491, 503
    articular branch of, BP110, BP108, 490
    saphenous branch of, BP110
  descending, saphenous branch of, BP108, 490
  lateral
    inferior, BP110, BP108, 503, 508–512
    superior, BP110, BP108, 492, 503, 507–509, 511–512
  medial
    inferior, BP110, BP108, 490–491, 503, 508–509, 511–512
    superior, BP110, BP108, 490–492, 503, 507–509, 511–512
  middle, BP110, BP108, 503
  superior lateral, 510
Genicular veins, BP107
Geniculate body
  lateral, 118, 121–122, 124, 127, 131, 143, 150, 154–156
  medial, 118, 121–122, 124, 150, 154–156
Geniculate ganglion, 59–60, 62, 107, 110, 134–136, 146
Genioglossus muscle, T2.1, T2.4, BP22, 45, 50, 68, 70, 77, 139
Geniohyoid fascia, 33
Geniohyoid muscle, BP22, T2.5, 33, 50, 69–70, 77–78, 139–140
Genital cord, 371
Genital tubercle, 370
Genitalia
  external, 173, 358, 362–363
    female, 395
    homologues of, 370
    innervation to, 172
    male, 391
    nerves of, 391
  internal, homologues of, 371
Genitalia *(Continued)*
  lymph nodes of
    female, 388
    male, 390
  lymph vessels of
    female, 388
    male, 390
Genitofemoral nerve, T5.2, 264, 269, 311, 316, 391, 486–488, 530
  femoral branches of, 260, 264, 269, 391, 473, 487
  genital branch of, 260, 262, 264, 269, 369, 391, 473, 487
Gerdy's tubercle, BP112, 484, 500, 504–505
  iliotibial tract to, 498
Gerota's fascia. *See* Renal (Gerota's) fascia
Gimbernat's ligament. *See* Lacunar ligament (Gimbernat's)
Gingiva, lamina propria of, 74
Gingival epithelium, 74
Gingival groove, 74
Glabella, 8, 11, 13
Gland lobules, 188
Glans, of clitoris, 370
Glans penis, 333, 364, 367, 370
  corona, 364
  neck, 364
Glassy membrane, BP1
Glenohumeral joint, BP57, 470
  capsule of, 422
Glenohumeral ligament
  inferior, 412
  middle, 412
  superior, 412
Glenoid cavity, of scapula, 192, 409, 411–412, 470
Glenoid labrum, 412
  inferior, 470
  superior, 470
Glial process, BP11
Glisson's capsule. *See* Perivascular fibrous (Glisson's) capsule
Glomerulus, 130
Glossoepiglottic fold
  lateral, 71
  median, 71
Glossoepiglottic ligament, median, 91
Glossopharyngeal nerve (CN IX), 40–41, 49, 64, 66, 72, 76, 83, 115, 124, 127–128, 134, 137, 141–142, 144–146, 214
  branch of, 173
  carotid sinus nerve of, 41
  distribution of, 129
  inferior (petrosal) ganglion of, 64, 146
  in jugular foramen, 20
  in jugular fossa, 19
  lingual branch of, 146
  schema of, 136
  tympanic branch of, 19
Gluteal aponeurosis, 492
  over gluteus medius muscle, 257, 312, 484–485
Gluteal artery
  inferior, BP98, 266, 317, 380, 384–385, 492
  superior, BP98, 266, 317, 380, 384–385, 489, 492
Gluteal fold, 161, 471
Gluteal lines, 476
  anterior, 338, 476
  inferior, 338, 476
  posterior, 338, 476
Gluteal nerves
  inferior, 169, 487, 489, 492–493
  superior, 169, 487, 489, 492–493
Gluteal region, 3
Gluteal surface. *See* Ilium, ala of
Gluteal vein
  inferior, 267
  superior, 267, 298
Gluteus maximus muscle, BP86, T8.4, BP109, 161, 180, 183, 257, 312, 343, 360, 363–364, 377, 392–393, 395, 400–401, 471, 481, 484–485, 492–494, 496, 534
  sciatic bursa of, 494
  trochanteric bursa of, 494
    inferior extension of, 494
Gluteus maximus tendon, BP109
Gluteus medius muscle, T8.1, T8.4, BP109, 161, 395, 400–401, 471, 481–482, 486, 490–494
  gluteal aponeurosis over, 484–485
  trochanteric bursae of, 494
Gluteus minimus muscle, BP86, T8.4, BP109, 480–481, 485, 490–494
Gluteus minimus tendon, 400
Gonadotropic hormone, BP92
Gonads, 371
  retroperitoneal, 368
Graafian follicle, BP95
Gracile fasciculus, BP43, 124
Gracile tubercle, 124–125
Gracilis muscle, T8.1, T8.4, 395, 480, 482–483, 485, 490–492, 496–498, 501, 507, 530
Gracilis tendon, 471, 482–483
Granular foveolae, 16, 111, 113
Granulosa, BP95
Gray matter, BP43
  imaging of, BP32, 160
  lateral horn of, 174, 322
  of spinal cord, 174
  of spinal nerves, 174
Gray rami communicantes, BP41, BP39, 141, 143–145, 172, 174, 177, 197, 213, 231–232, 234–235, 243, 269, 300, 303, 320–321, 392, 394, 397–399, 488–489
Great auricular nerve, 184
Great cardiac vein, 222
Great cerebral vein (of Galen), 114–115, 117, 125, 155–157
  imaging of, BP31, 159
Great saphenous vein, BP107, 5
Great vessels, of superior mediastinum, 210
Greater occipital nerve, 184
Greater omentum, 270, 272, 283, 285
Greater thoracic splanchnic nerve, BP39, 201, 213, 234–235
  left, 200, 220, 243
  right, 200, 243
Gubernaculum, 368, 371

H

Habenula, 121
Habenular commissure, 117, 122, 125
Habenular trigone, 122
Hair
  bulb of, BP2
  cortex of, BP2
  cuticle of, 1–2
  matrix of, BP1
  medulla of, BP2
  root sheath of
    external, BP2
    internal, BP2
  shaft of, BP2
Hair cells
  inner, 109
  outer, 109
Hair follicle, BP41, BP1
  external sheath of, BP1
  internal sheath of, BP1
  papilla of, BP1
Hamate bone, BP102, 442–443, 445–446, 452

- **Hamstring muscle**, T8.1
- **Hand**
  - arteries of, 456, 459
  - bones of, 446
  - bursae of, 453
  - cross section of, 105–106
  - cutaneous innervation of, 462
  - cutaneous nerves of, 406
  - dorsal fascia of, 453
  - dorsum of, 3
  - extensor zones of, BP103
  - flexor zones of, BP103
  - intrinsic muscles of, 455
  - nerves of, 456, 459
  - radial nerve in, 469
  - radiographs of, 447
  - spaces of, 453
  - superficial palmar dissections of, 449
  - superficial radial dissection of, 457
  - superficial veins of, 406
  - tendon sheaths of, 453
- **Hard palate**, BP22, 72, 77
  - imaging of, 160
  - posterior nasal spine of, BP19
- **Haustra**, 280, 283
- **Haversian canals, capillaries in**, BP7
- **Head**, 8–160
  - autonomic nerves in, 142
  - bony framework of, 22
  - cutaneous nerves of, 9
  - lymph vessels and nodes of, 85
  - nerves of, 82
  - radiate ligament of, BP33
  - superior articular facet on, BP33
  - surface anatomy of, 8
- **Heart**, BP41, BP10, 137, 173
  - anterior aspect of, BP51
  - anterior exposure of, 216
  - apex of, BP51, 216, 218, 248
  - auscultation of, 217
  - base and diaphragmatic surface of, 218
  - conducting system of, 229
  - CT angiograms, 217
  - inferior border of, 216
  - innervation of, 172, 231
  - left border of, 202, 216
  - radiographs of, 217
  - right border of, 202
  - in situ, 215–233
  - valves and fibrous skeleton of, 226–227
- **Heart valves**
  - aortic, T4.2, BP57, T4.1, 217, 221, 225–229
  - mitral, 217, 220–221, 225–229, 248
  - pulmonic, 217
  - tricuspid, 217, 220–221, 224, 226–228
- **Heel**, 2
- **Helicotrema, of cochlea**, BP28, 105, 108–109
- **Helix**, 8, 106
  - crux of, 106
- **Hematopoietic cells**, BP7
- **Hemiazygos vein**, 198, 200, 220
  - accessory, 198, 211, 235, 241, 247
- **Hemidiaphragm, right**, 217
- **Henle layer**, BP2
- **Hepatic arteries**, 287
  - branch of, 286
  - common, 273, 275, 279, 287, 290–291, 293–294, 300, 303, 309
  - intermediate, 291
  - left, 290–291
  - nerve branches of, BP63
  - proper, 274, 278–279, 284–285, 288, 290–293, 303, 324, 329
  - right, 290
  - variations in, BP70
- **Hepatic duct**, 287
  - common, BP62, 284, 287, 291
  - left, 288
  - right, 288
  - variations in, BP68
- **Hepatic plexus**, 137, 301–302, 304
- **Hepatic portal vein**, T5.2, 221, 233, 241, 274, 276, 278–279, 284, 287–288, 296–299, 324, 326
  - tributaries of, 299
  - variations and anomalies of, BP71
- **Hepatic veins**, 236, 241, 267, 284–285, 296
- **Hepatoduodenal ligament**, 273, 276, 279, 329
- **Hepatogastric ligament**, 276, 285
- **Hepatopancreatic ampulla, sphincter of**, 309
- **Hepatorenal recess (Morison's pouch)**, BP84
- **Hepatorenal space (of Morrison)**, 278
- **Hering-Breuer reflex**, 214. *See also* Stretch receptors (Hering-Breuer reflex)
- **Hernial sac**, BP59
  - neck of, BP59
- **Hesselbach's triangle**. *See* Inguinal (Hesselbach's) triangle
- **Hilar lymph nodes**, 205. *See also* Bronchopulmonary (hilar) lymph nodes
- **Hilum**, 205, 289
- **Hinge joints**, BP5
- **Hip**
  - arthrogram of, 534
  - cross-sectional anatomy of, BP109
  - MRI of, 534
  - muscle of, 484–485
    - bony attachments of, 480–481
  - nerves of, 493
  - radiograph of, 534
- **Hip bursa**, 494
- **Hip joint**, T8.1, 477
  - anteroposterior radiograph of, 478
  - iliofemoral ligament of, 486
  - ligaments of, 483
- **Hippocampal sulcus**, 123
- **Hippocampus**, 119, 122–123
  - alveus of, 123
  - fimbria of, 117, 119, 121–123, 130
  - pes of, 122–123
- **Homologous chromosomes**, BP91
- **Hook of hamate**, BP102, 432, 438, 442, 444, 446–448
- **Horizontal cells**, 131
- **Horizontal fissure, of lungs, right**, 205
- **Horizontal plate, of palatine bone**, BP29, 11, 17, 23, 43–45, 67, 73
- **Horn**
  - anterior, BP43
  - posterior, BP43, 174
- **Humeral artery**
  - anterior circumflex, BP100, 417–419, 421, 423–424
  - posterior circumflex, BP100, 417–419, 422–424
- **Humeral ligament, transverse**, 412
- **Humeral lymph nodes**, 190–191
- **Humeral vein, posterior circumflex**, 405
- **Humerus**, T7.1, 4–5, 217, 409, 411, 423, 425–428
  - anatomical neck of, 409–410
  - anterior view of, 409
  - body of, 247
  - capitulum of, 409
  - coronoid fossa of, 409
  - epicondyles of
    - lateral, 409–410, 421–422, 426–428, 430–433, 435, 438, 469
    - medial, 409–410, 421–423, 426–428, 430–438, 467–468
  - greater tubercle of, 409–412, 417, 421
    - crest of, 409
- **Humerus** *(Continued)*
  - head of, 409–411, 470
  - intertubercular sulcus, 409
  - lateral supracondylar ridge, 409–410
  - left
    - head of, 217
    - shaft of, 245
  - medial supracondylar ridge, 409–410
  - posterior view of, 410
  - radial fossa of, 409
  - right, surgical neck of, 245
  - shaft of, 246
  - surgical neck of, 409–410, 470
  - trochlea of, 409
- **Huxley layer**, BP2
- **Hyaloid canal**, 100
- **Hydatid of Morgagni**, 355
- **Hydrocele**, 369
- **Hymen, variations of**, BP96
- **Hymenal caruncle**, 353, 358
- **Hyoepiglottic ligament**, 77, 90
- **Hyoglossus muscle**, T2.5, 34–36, 41, 68–70, 72, 78, 81, 139
- **Hyoid bone**, BP34, BP4, 22, 32, 35–36, 38, 41, 53, 68, 70, 75, 77–78, 81, 87, 89–90, 92
  - body of, 22, 69
  - greater horn of, 22, 69, 81
    - tip of, 88
  - lesser horn of, 22, 69
- **Hyperplastic lateral lobe**, BP98
- **Hyperplastic middle lobe**, BP98
- **Hypertonic stomach**, BP60
- **Hypochondriac region**
  - anterior, 2
  - left, 251
  - posterior, 3
  - right, 251
- **Hypogastric nerve**, BP39, 305, 320–321, 391–392, 396–399
  - left, 394
  - right, 394
- **Hypogastric (neurovascular) sheath**, 347
- **Hypogastric plexus**, 392
  - inferior, 306, 320–321, 391–392, 394, 396–399
  - superior, 172, 299, 305–306, 320, 344, 348, 392, 394, 396–399
  - uterovaginal, 397
- **Hypogastric region**, 2, 251
- **Hypoglossal canal**, BP19, 15, 17, 19–20
- **Hypoglossal nerve (CN XII)**, 39–41, 49, 59, 64, 68, 76, 82–84, 86, 115, 124, 128, 139–140
  - distribution of, 129
  - in hypoglossal canal, 19–20
  - meningeal branch of, 139
  - nucleus of, 127–128, 139
  - schema of, 139
  - vena comitans of, 70, 84
- **Hypoglossal trigone**, 125
- **Hypophyseal artery**
  - inferior, 148, 151
  - superior, 148, 151
- **Hypophyseal fossa, of newborn**, 52
- **Hypophyseal portal system, primary plexus of**, BP30
- **Hypophyseal portal veins**
  - long, BP30
  - short, BP30
- **Hypophyseal veins, efferent**, 151
- **Hypophysis**, 115, 117–118, 158
  - arteries and veins of, BP30
  - in sella turcica, 43
- **Hypothalamic area, lateral**, 146
- **Hypothalamic artery**, 151
- **Hypothalamic nucleus**
  - paraventricular, 158
  - supraoptic, 158
- **Hypothalamic sulcus**, 117, 125, 158

Hypothalamic vessels, BP30
Hypothalamohypophyseal tract, 158
Hypothalamus, BP10, 119, 158
  arteries and veins of, BP30
  principal nuclei of, 158
    arcuate (infundibular), 158
    dorsomedial, 158
    mammillary body, 158
    paraventricular, 158
    posterior, 158
    supraoptic, 158
    ventromedial, 158
Hypothenar compartment, BP104
Hypothenar eminence, 402
Hypothenar muscles, BP105, 447, 449–450, 453, 467
Hypotonic stomach, BP60

I

Ileal arteries, 294–295
Ileal orifice, 283
Ileal papilla, 281
Ileal veins, 297
  internal, 298
Ileocecal fold (bloodless fold of Treves), 280
Ileocecal junction, BP85
Ileocecal lips, 281
Ileocecal recess
  inferior, 280
  superior, 280
Ileocecal region, 279–281, 304
Ileocolic artery, 280, 294, 305, 316
Ileocolic nodes, BP82
Ileocolic plexus, 305
Ileocolic vein, 297–299
Ileum, 85–86, 270, 279, 283, 297, 331
  circular muscle layer of, 279
  terminal part of, 272, 280–281, 344, 348
Iliac artery
  common, BP85, 4, 300, 311, 316–317, 380, 382, 384–385, 394
    left, 384
    right, 384
  deep circumflex, BP108, 491, 503
    ascending branch of, 258, 266
  external, 4, 108–109, 266, 300, 311, 316, 353, 380, 382, 384, 394, 491, 503
  internal, BP86, 4, 266, 293, 295, 300, 311, 316–317, 356, 380, 382, 384, 394
  superficial circumflex, BP108, 254, 266, 503
Iliac crest, BP85, 161, 167, 180–183, 249–250, 257, 311–312, 333–334, 337–338, 471, 474, 476, 484–486, 492–493
  iliac tubercle of, 338
  inner lip of, 250, 334, 338, 476
  intermediate zone of, 250, 334, 338, 476
  outer lip of, 250, 334, 338, 476
  tuberculum of, 250, 334, 476
Iliac fascia, 264, 347
Iliac fossa, 337–338, 344. *See also* Ilium, ala of
Iliac lymph nodes, 7
  common, 268, 388, 390
  external, 268, 319, 390, 475
    inferior, 388
    superior, 388
  internal, 268, 319, 388, 390
Iliac plexus
  common, 394
  external, 394
  internal, 394
Iliac spine
  anterior
    inferior, 250, 265, 334, 337–338, 342, 476–477
Iliac spine *(Continued)*
    superior, BP58, T5.1, 249–250, 252–253, 262–263, 265, 333–334, 337–338, 359, 362, 471, 476–477, 482, 484, 486, 490
  posterior
    inferior, 167, 476
    superior, 161, 167, 337–338, 476
Iliac tubercle, 337
Iliac tuberosity, 250, 334, 476
Iliac vein
  common, BP86, 5, 267, 381
  deep circumflex, 267
    tributaries to, 259
  external, BP107, BP109, 5, 267, 353, 381, 491
  internal, T6.2, 5, 267, 381
  superficial circumflex, BP107, 259, 267, 333, 473
Iliac vessels
  common, BP98, 272, 383, 394
  deep circumflex, BP98, 256, 264, 347
  external, BP98, 256, 262, 264, 280, 344–349, 356–357, 374, 383, 385
    covered by peritoneum, 263
    left, 385
  internal, BP98, 347, 383
    right, 385
  superficial circumflex, BP58, 252, 490
Iliacus fascia, 374
Iliacus muscle, T8.4, T5.3, T6.3, 262, 265, 311, 347, 374, 400, 480, 482, 486, 488–489, 495, 529
  muscular branches to, 488
  nerve to, 487
Iliococcygeus muscle, T6.3, 339–343, 353, 377
Iliocostalis cervicis muscle, 181
Iliocostalis lumborum muscle, 181
Iliocostalis muscle, 181
Iliocostalis thoracis muscle, 181
Iliofemoral joint capsule, 495
Iliofemoral ligament, BP109, 477, 495
  of hip joint, 486
Iliohypogastric nerve, T5.2, 169, 183, 269, 311–312, 391, 396, 486–488, 530
  anterior branch of, 487
  anterior cutaneous branch of, 260, 269, 391
  lateral cutaneous branch of, 257, 260, 474, 487
Ilioinguinal nerve, T5.2, 169, 263, 269, 311, 391, 396, 486–488, 530
  anterior scrotal branches of, 269, 391, 473
  labial branch of, anterior, 395
Iliolumbar artery, BP98, 266, 317, 384–385
Iliolumbar ligament, 167, 312, 337
Iliolumbar vein, 267
Iliopectineal bursa, 477, 486
Iliopectineal line, 374
Iliopsoas muscle, BP109, 256, 400–401, 480–481, 483, 490–491, 496. *See also* Iliacus muscle
Iliopsoas tendon, 495
Iliopubic eminence, 250, 334, 337–338, 342, 476–477
Iliopubic tract, 262, 344, 347–348
Iliotibial tract, T8.1, 395, 471, 480, 482, 484–485, 496–499, 501, 505–507, 510–512
  bursa deep to, 497–498
  to Gerdy's tubercle, 498
  vastus lateralis muscle deep to, 492
Ilium, 476, 478
  ala of, 250, 334, 338, 342, 476, 534
  arcuate line of, 340
  body of, 338, 476
  radiology of, 165, 335
Incisive canal, 15, 43, 45–46, 48, 77
  anastomosis in, 57
Incisive fossa, 17, 19, 23, 67, 73
Incisive papilla, 67
Incisor teeth, 73–74
Incus, BP28, 60, 105–106, 109, 135
  lenticular process of, BP27, 106
  long limb of, BP27, 106
  posterior ligament of, BP27
  short limb of, BP27, 106
  superior ligament of, BP27
Indirect inguinal hernia, BP59
Inferior, as term of relationship, 1
Inferior articular facet, of L4, BP36
Inferior articular process, 163–164
  of L1, BP37
  of L2, 165
  of L3, BP37
Inferior fascia, 349
  of pelvic diaphragm, 359
Inferior hypogastric plexus, 39–40, 172
Inferior mesenteric ganglion, BP41, BP39
Inferior mesenteric plexus, BP39
Inferior nodes, 389
Inferior phrenic nodes, 268
Inferior pubic ligament, 250
Inferior pubic ramus, 250
Inferior vena cava, BP38, BP87, BP98, BP84, 5, 267, 273–276, 278, 284, 288, 293, 296, 311–313, 323, 326–332, 344, 347–348, 381–384, 394
Inferior vertebral notch, of L2 vertebra, BP37
Inferolateral lobe, BP97
Inferoposterior lobe, BP97
Infraclavicular fossa, 2
Infradiaphragmatic fascia, 239
Infraglenoid tubercle, 409–410
Infraglottic cavity, 92
Infrahyoid artery, 87
Infrahyoid fascia, 33
Infrahyoid muscle, fascia of, 32–33
Inframammary lymph nodes, 191
Inframammary region, 2
Infraorbital artery, 10, 42, 57, 63, 83, 94, 99
Infraorbital foramen, BP17, 11–13, 42
  of newborn, 21
Infraorbital groove, 11
Infraorbital margin, 8
Infraorbital nerve, BP26, 9, 42, 61–64, 66, 82, 94, 98, 132–133
  internal nasal branches of, 48
  superior alveolar branches of, 133
Infraorbital vein, 10, 84
Infrapatellar bursa
  deep, 502
  subcutaneous, 502
Infrapatellar fat pads, 498–499, 502
Infrapatellar synovial fold, 498–499
Infrascapular region, 3
Infraspinatus fascia, 180, 183, 257, 413
Infraspinatus muscle, T7.4, 161, 186, 197, 245–247, 410, 413, 415–418, 422, 468
Infraspinatus tendon, 412, 415, 417, 422
Infraspinous fossa, 410
  of scapula, 192
Infratemporal crest, 13
Infratemporal fossa, 13, 23
  superior view of, 60
Infratrochlear nerve, 9, 42, 61, 97, 133
  left, 98
  right, 98
Infundibular process, 158
  capillary plexus of, BP30
Infundibular recess, 117
Infundibular stem, 158
Infundibulum, 124, 158, 355
  of uterine tube, 357
Inguinal canal, BP109, 263–264
Inguinal falx, BP58, 253–254, 256, 262–263
Inguinal fold, 371

- **Inguinal (Hesselbach's) triangle**, T5.1, 256, 262
- **Inguinal ligament (Poupart's)**, BP107, BP58, T5.1, 249, 252–254, 262–265, 333, 340, 356, 359, 362–363, 389, 471, 473, 475, 482, 488, 491
  - reflected, 253–254, 262
- **Inguinal lymph nodes**, 7
  - deep, 475
- **Inguinal nerve**, 260
  - anterior scrotal branch of, 260
- **Inguinal nodes**
  - of Cloquet, proximal deep, 388–390
  - deep, 268, 388–390
  - superficial, 268, 388–390, 475
    - inferior, 475
    - superolateral, 475
    - superomedial, 475
- **Inguinal region**, BP58, 2
  - dissections of, 262
  - left, 251
  - right, 251
- **Inguinal ring**
  - deep, BP59, T5.1, 254, 256, 262, 344, 346–348, 368
  - lateral crus, 262
  - medial crus, 262
  - superficial, BP58, 252, 262–263, 359, 363, 368–369
- **Inhibin**, BP92
- **Inion**, 13–15, 17, 23
- **Initial segment**, BP11
- **Insula (island of Reil)**, 116, 121, 152
  - central sulcus of, 116
  - circular sulcus of, 116
  - limen of, 116
  - long gyrus of, 116
  - short gyrus of, 116
- **Integumentary system**, T5.1
- **Interalveolar septa**, 24
- **Interarytenoid notch**, 79
- **Interatrial septum**, 224, 248
- **Intercalated node**, 85–86
- **Intercapitular veins**, BP99, 406, 458
- **Intercarpal ligament, dorsal**, 445
- **Intercartilaginous ligaments**, 208. *See also* Anular ligaments
- **Intercavernous septum, of deep fascia**, 363–364, 367
- **Intercavernous sinus**
  - anterior, 114–115
  - posterior, 114–115
- **Interchondral joints**, 193
- **Interclavicular ligament**, 193
- **Intercondylar area**
  - anterior, 504–505
  - posterior, 505
- **Intercondylar eminence**, 499, 501, 504–505
- **Intercondylar fossa**, 479
- **Intercondylar tubercles**, 505
- **Intercostal artery**, 197, 258
  - anterior, 196–197
  - collateral branches of, 196
  - cutaneous branches
    - anterior, 260
    - lateral, 260
  - lower, anastomoses, 258
  - posterior, 176, 194–195, 197, 234–235, 417
    - dorsal branch of, 177, 197
    - lateral mammary branches of, lateral cutaneous branches of, 189, 197
    - right, 197, 211, 240
    - spinal branch of, 197
  - supreme, BP23, 147, 149
- **Intercostal membrane**
  - external, 186, 197, 417
  - innermost, 186
  - internal, 186, 197
- **Intercostal muscles**, BP56, 188, 204, 221, 245–247, 258
  - external, T4.3, 182, 186, 194–195, 197, 253, 258, 261, 417
    - internal intercostal membrane deep to, 197, 234–235
  - innermost, T4.3, 196–197, 234–235, 258, 261
  - internal, T4.3, BP47, 186, 194–197, 258, 261, 417
- **Intercostal nerves**, T5.2, T4.1, 169, 188, 195–197, 232, 234–235, 487
  - anterior cutaneous branches of, 194, 196–197, 417
  - anterior ramus of, 177, 186
  - collateral branches of, 196
  - cutaneous branches of
    - lateral, 183
    - posterior, 183
  - eight, 213
  - first, 231
  - lateral cutaneous branches of, 194–195, 197, 417
    - anterior branch of, 197
  - lower, 199
  - sixth, 213
  - third, 243
- **Intercostal nodes**, 242
- **Intercostal veins**, 5
  - anterior, 196, 198
  - collateral branches of, 196
  - posterior, 198, 234–235
    - right, 241
  - superior
    - left, 235, 241
    - right, 198, 234, 241
- **Intercostobrachial nerve**, 195, 260, 404–405, 417, 419, 463
- **Intercrural fibers**, BP58, 252, 262–263
- **Intercuneiform ligaments, dorsal**, 518
- **Interdigitating fibers, of perineum**, 341
- **Interfascicular fasciculus**, BP43
- **Interfoveolar ligament**, 256
- **Intergluteal cleft**, 161
- **Interlobar lymph vessels**, 212
- **Interlobular arteries**, 314
- **Intermaxillary suture**, 17, 42
- **Intermediate bronchus, right**, BP56
- **Intermediate nerve (of Wrisberg)**, 107, 134, 142, 146
  - motor root of, 135
- **Intermediate sulcus, posterior**, BP43
- **Intermediolateral cell column**, 322
- **Intermediolateral nucleus**, BP43
- **Intermesenteric (abdominal aortic) plexus**, 269, 300, 304–305, 321, 392, 394, 396–399
- **Intermetacarpal joints**, 445
- **Intermuscular septum**
  - anterior, 514
  - lateral, 421–422, 425, 435, 438, 468
  - medial, 421–422, 425, 435, 437–438
  - posterior, 514
  - transverse, 514
- **Intermuscular stroma**, 308
- **Internal abdominal oblique muscles**, 185
- **Internal capsule**, 119, 121, 152
  - anterior limb of, 121
    - imaging of, 160
  - cleft for, 121
  - genu of, 121
    - imaging of, 160
  - posterior limb of, 121
    - imaging of, 160
  - retrolenticular part of, 121
- **Internal carotid nerve**, BP41, BP39
- **Internal carotid plexus**, BP39, 19
- **Internal genitalia, homologues of**, 371
- **Internal jugular vein, left**, 179
- **Intervertebral (neural) foramen**, BP34
  - exiting L4 nerve root, BP38
- **Internal oblique muscle**, 344, 348
- **Internal occipital protuberance**, 18
- **Internal os**, 355
- **Internal vertebral venous plexus, anterior**, BP42
- **Interosseous artery**
  - anterior, 100–101, 424, 435, 437–438, 441
  - common, 100–101, 424, 437–438, 441
  - posterior, 100–101, 424, 435, 438, 441
  - recurrent, 100–101, 424, 435
- **Interosseous compartments**
  - dorsal, BP104
  - palmar, BP104
- **Interosseous fascia**
  - dorsal, 453
  - palmar, 453
- **Interosseous intercarpal ligaments**, 445
- **Interosseous membrane**, BP102, BP110, BP116, BP111, BP108, 429, 431, 433, 441, 444, 501–503, 509, 512, 514, 517
- **Interosseous muscle**, BP105, BP117, 454, 519, 527
  - dorsal, T7.4, BP106, 453, 455, 460, 522, 527–528
    - first, BP105, 435, 450, 455, 457, 467
  - palmar, T7.4, 453, 455, 467
- **Interosseous nerve**
  - anterior, 438, 441, 466
  - crural, 532
  - posterior, 435, 441, 469
- **Interosseous veins, anterior**, BP99
- **Interpectoral (Rotter's) lymph nodes**, 190–191
- **Interpeduncular cistern**, 120
  - imaging of, BP32
- **Interpeduncular fossa**, 50
- **Interphalangeal (IP) joint**, 519
- **Interphalangeal ligaments**, 448
- **Interscapular region**, 3
- **Intersigmoid recess**, 272, 316
- **Intersphincteric groove**, 374–376
- **Interspinales muscle**, T3.2
- **Interspinalis cervicis muscle**, 182
- **Interspinalis lumborum muscle**, 182
- **Interspinous ligament**, 167–168
- **Interspinous plane**, 251
- **Intertendinous connections**, 460
- **Interthalamic adhesion**, 117, 121–122, 125, 157–158
- **Intertragic notch**, 106
- **Intertransversarii muscle**, T3.2
- **Intertransversarius laterales lumborum muscle**, 182
- **Intertransverse ligament**, 193
- **Intertrochanteric crest**, 477, 493
- **Intertrochanteric line**, 477
- **Intertubercular plane**, 251
- **Intertubercular sulcus**, 409
- **Intertubercular tendon sheath**, 412, 417, 421
- **Interureteric crest**, 352
- **Interventricular artery, anterior, diagonal branch of**, 222
- **Interventricular branch**
  - anterior, 223
    - diagonal branches of, 223
  - inferior, 223
- **Interventricular foramen (of Monro)**, 117, 120, 125, 156–157
  - imaging of, 160
  - left, 117
- **Interventricular septal branches**, 222
- **Interventricular septum**, 228, 248
  - membranous part of, 224
  - muscular part of, 224–225, 227–229

Interventricular sulcus
  anterior, BP51, 248
  inferior, 218–219
Intervertebral disc space, BP37
  C6-C7, BP34
  L4-L5, BP36
Intervertebral discs, T3.1, BP33, 164, 168
  C6-C7, BP35
  cervical, 28–29
  L1-2, cross section at, 331
  lumbar, 167
    L2-L3, 165
  lumbosacral, 338
  T12-L1, cross section at, 330
Intervertebral foramen, BP37, T3.1, BP36, BP34, T3.2, 28, 164, 166–168, 186
  narrowing of, BP18
Intervertebral vein, BP42, 178
Intestinal arteries, T5.2
Intestinal trunk, 268
Intestines, 173, 233. *See also* Large intestine; Small intestine
  autonomic innervation of, 306
  enteric plexus of, 308
  lymphoid nodules of, 7
  mesenteric relations of, 271
  superior, 172
Intima, of arterial wall, BP16
Intraarticular ligament, BP33
  of head of rib, 193
Intraarticular sternocostal ligament, 193
Intraclavicular node, 407
Intraculminate vein, 155
Intralaminar nuclei, 122
Intralobular arteriole, 286
Intralobular bile ductules, 286
Intraparietal sulcus, 116
Intrapulmonary airways, 209
  schema of, BP48
Intrapulmonary blood circulation, schema of, BP49
Intrapulmonary lymph nodes. *See* Pulmonary (intrapulmonary) lymph nodes
Intrarenal arteries, 315
Intrinsic back muscles, T3.1
Intrinsic muscle
  of larynx, 91
    action of, 93
  of tongue, 71
Inversion, of lower limbs movements, 472
Investing fascia, BP90, 353, 359–360, 363–365, 373, 377
  deep, 349, 352
Iridocorneal angle, 100–101, 103
Iris, 94, 100, 102–103
  arteries and veins of, 104
  folds of, 101
  major arterial circle of, 101, 103–104
  minor arterial circle of, 101, 103–104
Irritant receptors, 214
Ischial ramus, 478
Ischial spine, T6.1, 167, 250, 265, 334, 337–342, 380, 393, 395, 476–477, 493
  measurements of, 336
  radiograph of, 335
Ischial tuberosity, T6.1, 167, 250, 334, 337–338, 341, 343, 359–360, 362–365, 374, 377, 401, 476–478, 485, 492–493
  radiograph of, 335
  ramus of, 476
    measurements of, 336
Ischioanal fossa, 360, 374
  anterior recess of, 256, 352–353
  fat body of, 359, 362, 374, 400
  fibrous septum of, transverse, 376–377
  levator ani muscle roofing, 363
  transverse fibrous septum of, 374
Ischiocavernosus muscle, T6.3, 345, 352–353, 359–361, 363–365, 373, 377, 386–387
Ischiofemoral joint capsule, 495
Ischiofemoral ligament, BP109, 477, 495
Ischiopubic ramus, 337–338, 343, 349, 353, 359–360, 362, 364–366, 377
Ischium; *See* Ischial tuberosity
Island of Reil. *See* Insula (island of Reil)
Isthmus, 355
  of uterus, 355

J

Jejunal arteries, 294–295
  anastomotic loop (arcade) of, 279, 294
Jejunal veins, 297
Jejunum, 270–271, 278–279, 297, 327, 330–331
  circular muscle layer of, 279
  longitudinal muscle layer of, 279
  submucosa of, 279
Joint capsule, BP6, BP117, 428, 448, 497, 499, 511
  attachment of, 502
  of foot, 519
  synovium lining, BP114
Joint fluid, BP109
Joints
  ball-and-socket, BP5
  connective tissues and cartilage of, BP6
  hinge, BP5
  pivot, BP5
  plane, BP5
  saddle, BP5
  synovial, BP5
  types of, BP5
Jugular foramen, 15, 20, 115, 136–138
Jugular fossa, BP27, 17, 19
Jugular nerve, 141
Jugular notch, 8, 32, 187, 202
  of sternum, 192
Jugular trunk, 85
Jugular vein
  anterior, 38, 87
    termination of, 84
  external, T2.2, 5, 8, 10, 38–39, 53, 84, 87, 204, 210, 215, 241
  internal, 5, 10, 32–33, 35, 37–38, 40–41, 49, 53, 64, 70, 76, 84, 86–89, 105, 107, 110, 139, 191, 195–196, 204, 212, 215, 236, 241
    imaging of, BP31, 159
    inferior bulb of, 88, 179
    in jugular fossa, 19
    left, 216, 221
    right, T2.2, 210, 217
    superior bulb of, 179
Jugulodigastric node, 85–86
Juguloomohyoid node, 85–86

K

Kidneys, BP38, BP57, T5.1, BP10, 173, 185, 233, 273, 278, 285, 368, 382
  autonomic nerves of, 320
  gross structure of, 314
  inferior pole of, 314
  innervation of, 172
    autonomic, 321
  lateral border of, 314
  left, BP87, BP84, 203, 274, 289, 316, 323
  lymph vessels and nodes of, 319
  major calyces of, 314
  medial border of, 314
  medulla (pyramids) of, 314, 330
  minor calyces of, 314
  parenchyma of, blood vessels in, BP78
  pole of, 278
Kidneys *(Continued)*
  renal capsule of, 314
  renal column (of Bertin) of, 314
  renal sinus of, 314
  right, 203, 274–276, 284, 310–311, 316, 318, 323, 326–327
    sagittal view of, 278
  as site of referred visceral pain, BP13
  in situ
    anterior view of, 311
    posterior view of, 312
    superior pole of, 314
  superior pole of, 314
Knee, 497–503
  anterior region of, 2
  arteries of, BP108
  bursa of, 499
  condyle of
    lateral, BP112
    medial, BP112
  epicondyle of, medial, BP112
  joint capsule of, 497
  osteology of, BP112
  posterior region of, 3
  radiograph of, BP113, 501
  transverse ligament of, 500

L

L5/S1 vertebrae, T3.1
Labia majora
  commissure of, anterior, 358
  posterior commissure of, 358
Labia minora, 356
  frenulum of, 358
Labia minus, 345
Labial artery
  inferior, 42, 83
  posterior, 361, 386
  superior, 42, 83
Labial nerves
  posterior, 395–396
Labial vein
  inferior, 84
  superior, 84
Labioscrotal swelling, 370
Labium majus, BP90, 345, 350, 353, 358, 370
Labium minus, BP90, 345, 350, 353, 358, 361, 370
Labrum
  anterior, BP109, 534
  posterior, BP109, 534
Labyrinthine artery, 20, 107, 150–152, 154
  left, 147
Lacrimal apparatus, 95
Lacrimal artery, 99, 149
  recurrent meningeal branch of, 112
Lacrimal bone, 11, 13, 44, 50
  of newborn, 21, 52
Lacrimal canaliculi, 95
Lacrimal caruncle, 95
Lacrimal gland, BP26, BP40, 50, 97–99, 144, 173
  excretory ducts of, 95
  innervation to, 172
  orbital part of, 95
  palpebral part of, 95
Lacrimal nerve, BP26, 61, 63, 97–98, 132–133, 142
  palpebral branch of, 9, 61
Lacrimal papilla
  inferior, 94–95
  superior, 94–95
Lacrimal punctum
  inferior, 94–95
  superior, 94–95

Lacrimal sac, 94–95
  fossa for, 11, 13
Lactiferous ducts, 188
Lactiferous sinus, 188
Lacuna magna, 367
Lacuna (of Trolard), lateral (venous), 111–112
Lacunar ligament (Gimbernat's), 253–254, 256, 262, 264–265
Lambda, 16
Lambdoid suture, BP17, 12, 14–16, 21
Lamina, BP38, T3.1, 164, 167–168
  anterior, of broad ligament, 357
  of C6, BP34
  of L1, 165
  of L4 vertebra, BP37
  lumbar, 167
  of mesosalpinx, 357
  of mesovarium, 357
  posterior, of broad ligament, 357
  thoracic, 163
Lamina affixa, 122
Lamina propria, of arterial wall, BP16
Lamina terminalis, 117–118, 125, 158
Large intestine, BP9, 283
  arteries of, 295
  autonomic innervation of, 305
  lymph vessels and nodes of, BP82
  veins of, 298
Laryngeal artery
  inferior, 92
  superior, 41, 80, 83, 87–89, 92, 147
Laryngeal inlet (aditus), 77, 79–80
Laryngeal nerve
  recurrent, T2.2, 33, 40, 76, 82, 92, 141, 236, 243
    left, 87–89, 137, 199, 210, 213–214, 216, 230, 235–236, 243, 245–246
    right, 34, 80, 87–89, 92, 137, 230, 243
  superior, 76, 137, 141–142, 146, 214, 243
    external branch of, 82, 87–89, 92, 137
    internal branch of, 75, 78, 80, 82, 87–89, 92, 137, 146
Laryngeal prominence, 90
Laryngeal vein, superior, 84
Laryngopharynx, BP44, 77, 79
Larynx, BP41, BP44, 146, 173, 214
  cartilages of, 90
  coronal section of, 92
  innervation to, 172
  intrinsic muscles of, 91
    action of, 93
  nerves of, 92
Lateral, as term of relationship, 1
Lateral aortic nodes, 268
Lateral aperture, 120
  left, 117
Lateral circumflex femoral vein, BP107
Lateral corticospinal tract, BP43
Lateral direct vein, 157
Lateral ligament, of ankle, 518
Lateral node, 390
Lateral plantar vein, BP107
Lateral recess, 125
  left, 117
Lateral rectus (semilunar) plane, BP62
Lateral semilunar plane. *See* Lateral rectus (semilunar) plane
Lateral sulcus
  anterior, BP43
  posterior, BP43
Latissimus dorsi fascia, 416
Latissimus dorsi muscle, T7.4, T3.2, 161, 180, 183, 185–187, 194, 248, 252–253, 257, 260–261, 312, 328, 409–410, 413–414, 416–417, 419, 421, 423
  digitations of costal origin of, 257
  left, 246
Latissimus dorsi tendon, 246–247, 423, 425
Least thoracic splanchnic nerve, 213
Left bundle
  Purkinje fibers of, 229
  subendocardial branches of, 229
Left lateral region, 251
Leg
  anterior compartment of, T8.1
  anterior region of, 2
  arteries of, BP110
  deep veins of, T8.2
  muscle of, 507–512
    attachments of, 506
  posterior region of, 2–3
  serial cross sections of, BP111
  venous drainage of, 513
Lens, BP26, 94, 100–103
  axis of, 102
  capsule of, 100–102
  cortex of, 102
  equator of, 102
  nucleus of, 101–102
  supporting structures of, 102
Lentiform nucleus, 121
  globus pallidus of, 119, 121
  putamen of, 119, 121
    imaging of, 160
Lesser occipital nerve, 9
Lesser thoracic splanchnic nerve, BP39, 201, 213
Lesser tubercle, 409, 411–412, 421
  crest of, 409
Levator anguli oris muscle, BP20, T2.5, 55, 134
Levator ani fascia, superior, 347
Levator ani muscle, BP90, T6.1, BP109, T6.3, 256, 265, 283, 299, 306, 324, 340–341, 345, 351–353, 359–360, 365, 375–376, 380, 384–386, 392–393, 489
  fibromuscular extensions of, 343
  iliococcygeus, 341–343, 377
  left, 339
  levator plate of, 340
  medial border of, 343
  median raphe of, 341
  muscle fibers from, 342–343
  muscular trochlea of, 265
  nerve to, 487, 489
  of pelvic diaphragm, 345, 349, 364, 373–374, 378
  prerectal muscle fibers from, 343
  puboanalis (puborectalis), 341, 377, 400–401
  pubococcygeus, 341–343, 377
  roofing ischioanal fossa, 363
  tendinous arch of, 339–343, 347, 350, 352–353, 360, 374
Levator costarum muscle, T4.3, 182
Levator labii superioris alaeque nasi muscle, BP21, T2.5, 31, 55, 134
Levator labii superioris muscle, T2.5, 20–21, 31, 55, 134
Levator palpebrae superioris muscle, BP26, T2.1, T2.5, 94, 96–98, 132
  insertion of, 94
Levator scapulae muscle, T7.4, 32–33, 36, 39, 180, 183, 410, 413, 417–418, 468
Levator veli palatini muscle, T2.1, T2.5, BP27, 49, 56, 67, 72, 75, 78, 81, 137
  interdigitating fibers of, 67
Levatores costarum muscles, 182
  brevis, 182
  longus, 182
Level of Carina, BP36
Ligament of Treitz, 271
Ligamenta flava, 29
Ligaments
  of ankle, 518
  of elbow, 428
  of foot, 519
  of pelvis, 357
  of uterus
    fascial, 354
    round, BP90, 344–346, 352–354, 356, 359, 371, 382
  of wrist, BP102, 444–445
Ligamentum arteriosum, 41–42, 210, 216, 225, 233, 235
  aortic arch lymph node of, 212
Ligamentum flavum, BP19, 167–168
  radiology of, 165
Ligamentum teres, of liver, 233, 285
  fissure for, 284
Ligamentum venosum, 233
  fissure for, 284
Limb, lower, 471–535
Limen nasi, 43
Linea alba, BP86, BP84, BP58, T5.1, 187, 194, 249, 252–255, 261–262, 333, 344, 348
Linea semilunaris, 249, 333
Linea terminalis, 166, 353
  of pelvis, 347–348
Linea translucens, 101
Lingual artery, 10, 41, 57–58, 68, 70, 83, 88, 144, 147, 149
  deep, 65
  dorsal, 70
    tonsillar branch of, 72
Lingual glands, 71
Lingual gyrus, 117
Lingual muscle, longitudinal
  inferior, T2.5, 70
  superior, T2.8
Lingual nerve, 25, 53, 56–57, 59, 65–66, 68–70, 82, 133–134, 142, 144–146
Lingual tonsil, 71–72, 77
Lingual vein, 10, 70, 84
  deep, 65
  dorsal, 70
Lingula, 24, 69, 126, 205
Lip
  commissure of, 8
  lower, frenulum of, 65
  philtrum, 8
  superior, tubercle of, 8
  upper
    frenulum of, 65
    tubercle of, 65
  vermillion border of, 8
Lister's tubercle, 429
Liver, BP62, BP38, T5.1, BP9, 56–57, 137, 173, 202–203, 217, 221, 233, 241, 273, 278, 287, 318, 324, 326, 328–329
  area for, 311
  arteries of, 290–291
  autonomic innervation of, 309
  bed of, 284
  caudate lobe of, 273, 276, 284–285
  coronary ligament of, 275
  falciform ligament of, 258
  fibrous appendix of, 284
  inferior border of, 276
  innervation to, 172
  left lobe of, 270, 276, 285
  lymph vessels and nodes of, BP83
  pathway to, 190
  quadrate lobe of, 276, 284
  right lobe of, BP87, 270, 276, 285
  round ligament of, 256, 284, 299
  as site of referred visceral pain, BP13
  structure of, 286
  surfaces and bed of, 284
  topography of, BP63

Liver *(Continued)*
- variations in form of, BP62, BP64
- vascular systems of, 285

Lobules, 8, 372
Locus coeruleus, 125
Longissimus capitis muscle, 181, 184
Longissimus cervicis muscle, 181
Longissimus muscle, 181
Longissimus thoracis muscle, 181
Longitudinal esophageal muscle, 239
Longitudinal fasciculi
- dorsal, 158
- medial, BP43, 125–126

Longitudinal fold, 287
Longitudinal ligament
- anterior, BP35, BP19, 29, 77–78, 167–168, 185, 193, 337, 344, 348
- posterior, BP35, BP19, BP33, 30, 167–168

Longitudinal muscle, BP54, 375
- conjoined, 374–376
- lateral mass of, 238

Longitudinal pharyngeal muscle, 75, 78, 80
Longitudinal vessels, BP12
Longus capitis muscle, T2.6, 36–37, 49, 68
Longus colli muscle, T2.6, 33, 37, 236
- innervation of, 420

Loop of Heiss, 351
Lower limb, 471–535
- arteries of, T8.2
- cutaneous anatomy of, 473–475
- lymphatics of, 7
- surface anatomy of, 471
- veins of, BP107

Lumbar arteries, 266
Lumbar artery, 176
Lumbar ganglion, 1st, 172
Lumbar lordosis, 162
Lumbar lymph nodes, 7, 268
- lateral, 388

Lumbar lymph trunks, 319
Lumbar plexus, 169, 486, 488, 529–530
- anterior rami of, 488

Lumbar region
- anterior, 2
- posterior, 3

Lumbar spinal nerves, 185
- enlargement, 170
- L1, 164–165, 169
  - anterior ramus of, 392
  - anterior view of, 162
  - dermatome of, 171
  - left lateral view of, 162
  - posterior view of, 162
  - vertebrae relation to, 170
- L2, 164
  - anterior ramus of, 167, 399
  - dermatome of, 171
  - ganglion, 394
  - superior view of, 164
  - vertebrae relation to, 170
- L3, 164
  - anterior ramus of, 397
  - dermatome of, 171
  - posterior view of, 164
  - superior view of, 164
  - vertebrae relation to, 170
- L4, 164, 167
  - dermatome of, 171
  - posterior view of, 164
  - vertebrae relation to, 170
- L5, 164, 169, 394
  - anterior ramus of, 392
  - anterior view of, 162
  - dermatome of, 171
  - left lateral view of, 162
  - posterior view of, 162
  - vertebra, body of, 167
  - vertebrae relation to, 170

Lumbar spine
- MRIs, BP38
- radiographs of, MRI, BP38
- T2-weighted sagittal MRI of, 165

Lumbar splanchnic nerves, BP39
Lumbar triangle (of Petit), 161, 180, 257
Lumbar trunk
- left, 268
- right, 268

Lumbar trunk ganglion
- lower, 232
- upper, 232

Lumbar veins
- ascending, 267
- right, 267

Lumbar vertebrae, BP37, 162, 164, 176
- articulated, lateral view of, 164
- body of, 164
- L1
  - body of, 167
  - spinal nerve relation to, 170
  - transverse process of, 201
- L2, spinal nerve relation to, 170
- L3
  - body of, 344, 348
  - spinal nerve relation to, 170
- L4, 379
  - body of, 338
  - intervertebral disc, 379
  - radiograph of, 335
  - spinal nerve relation to, 170
- L5, BP37, T3.1
  - body of, 338, 379
  - intervertebral disc, 379
  - radiograph of, 335
  - spinal nerve relation to, 170
- radiographs of, BP37
- section through, 177
- transverse process of, 250, 334

Lumbar vertebral body, 168
Lumbocostal ligament, 312
Lumbocostal triangle, 201
Lumbosacral plexus, 269, 487
Lumbosacral region, vertebral ligaments, 167
Lumbosacral trunk, 269, 320, 392, 486–489, 529–530
Lumbrical muscles, T8.5, T7.4, 105–106, 450–455, 466–467, 524–525, 527
- tendon of, 526

Lumbrical tendons, 451, 519
- distal, 451

Lumen, 308
Lunate (articular) surface, 338
Lunate bone, BP102, 442–443, 445–447
- articulation with, 429

Lunate sulcus, 116
Lunate surface, 476
Lungs, BP41, 173, 177, 188
- apex of, T4.1, 202, 217
- innervation to, 172
- left, 205, 215, 219–221, 244–247
  - anterior border of, 205
  - apex of, 203, 205
  - bronchopulmonary segments of, 206–207
  - cardiac impression of, 205
  - cardiac notch of, 202, 204
  - diaphragmatic surface of, 205
  - esophagus area of, 205
  - hilum of, 216
  - inferior border of, 202–203
  - inferior lobe of, 204–205
  - lower lobe of, BP57
  - lymph vessels and nodes of, 212
  - oblique fissure of, 202–203, 205, 246
  - root of, 199
  - superior lobe of, BP56, 204–205
  - trachea area of, 205
  - upper lobe of, BP57

Lungs *(Continued)*
- lymph nodes of, 212
- lymph vessels of, 212
- lymphatic drainage routes of, 212
- medial views of, 205
- right, 205, 215, 220–221, 245–247
  - anterior border of, 205
  - apex of, 205
  - bronchopulmonary segments of, 206–207
  - cardiac impression of, 205
  - diaphragmatic surface of, 205
  - esophagus area of, 205
  - hilum of, BP44, 216
  - horizontal fissure of, BP56, 202–205
  - inferior border of, 202
  - inferior lobe of, 204–205
  - lymph vessels and nodes of, 212
  - middle lobe of, BP56, 204–205
  - oblique fissure of, BP56, 202, 205
  - root of, 199
  - superior lobe of, 204–205
  - trachea area of, 205
- in situ, anterior view of, 204
- topography of
  - anterior view of, 202
  - posterior view of, 203

Lunotriquetral ligament, 444
Lunula, 227
Lunule, 460–461
Luteal cells, BP95
Luteinizing hormone, BP92
Lymph follicles, 71
Lymph nodes, 401
- axillary, 7
- cervical, 7
- of esophagus, 242
- in femoral canal, 264
- of genitalia
  - female, 388
  - male, 390
- of head, 85
- iliac, 7
- inguinal, 7
- lumbar, 7
- of lungs, 212
- of mammary gland, 7, 190
- mediastinal, 7
- of neck, 85
- paraaortic, T6.2
- of pelvis, T6.2
  - female, 388–389
  - male, 390
- of pharynx, 86
- popliteal, 475
- preaortic, T6.2, 388
- submandibular, 68
- tongue, 86
- tracheobronchial, T6.2

Lymph vessels, T8.2, 286
- along arcuate arteries, 319
- along arteries, 319
- along interlobar arteries, 319
- of esophagus, 242
- of genitalia
  - female, 388
  - male, 390
- of head, 85
- of lungs, 212
- of mammary gland, 190
- medullary, 319
- of neck, 85
- of pelvis
  - female, 388–389
  - male, 390
- of pharynx, 86
- superficial, 475
- tongue, 86

- **Lymphatic drainage**
  - of breast, 191
  - of lungs, 212
  - of pharynx, 86
  - of prostate gland, 390
  - of tongue, 86
- **Lymphatic duct, right**, 7, 191, 212
- **Lymphatic system**, T6.2, T4.2, T5.2, T4.1, 7
- **Lymphatic trunk**
  - bronchomediastinal, 212
  - jugular, 212
- **Lymphatics, abdominal and pelvic**, 325
- **Lymphocytes**, BP15
- **Lymphoid nodule, solitary**, 279

M

- **Mackenrodt's ligament**, 346, 353–354. *See also* Cardinal (Mackenrodt's) ligament
  - with uterine artery, 347
- **Macrophage**, BP6
- **Macula**, 103
- **Macular arteriole**
  - inferior, 103
  - superior, 103
- **Macular venule**
  - inferior, 103
  - superior, 103
- **Mallear fold**
  - anterior, BP27, 106
  - posterior, BP27, 106
- **Malleolar arteries, anterior**
  - lateral, BP110, BP115, 503, 512, 521–522
  - medial, BP110, 503, 512, 521–522
- **Malleolar region, medial, 00001#**
- **Malleolar stria, arteries of**, 107
- **Malleolus**
  - lateral, 471, 505, 507–512, 521–522
  - medial, BP116, 471, 505, 507, 509, 511–513, 520–522
- **Malleus**, 60, 106, 109
  - anterior ligament of, 106
  - anterior process of, BP27
  - handle of, BP27, 106–107
  - head of, 27–28, 105–106, 135
  - lateral process of, 106
  - superior ligament of, BP27, 106
- **Mammary gland**, T4.1
  - anterolateral dissection of, 188
  - arteries of, 189
  - lymph nodes of, 7, 190
  - lymph vessels of, 190
  - sagittal section of, 188
- **Mammary region**, 2
- **Mammillary bodies**, BP30, 50, 117–119, 123–124, 158
  - imaging of, BP32, 160
- **Mammillary process**, 164
- **Mammillothalamic fasciculus**, 117
- **Mammillothalamic tract (of Vicq d'Azyr)**, 158
- **Mandible**, 11–13, 22, 24, 33, 77
  - of aged person, 24
  - alveolar part of, 24
  - angle of, 8, 12, 22, 24, 76, 79
  - base of, 24
  - body of, BP22, 11–13, 22, 24, 36, 50
  - buccinator crest of, 81
  - condylar process of, 22, 24
    - head of, 13
  - condyle of, BP17, 12, 14
  - coronoid process of, BP17, 13–14, 22, 24, 49
  - head of, 24
  - mandibular foramen of, 24
  - mandibular notch of, 13
  - mental foramen of, 11, 13, 24
  - mental protuberance of, 8, 11, 24
  - mental spines of, 24
  - mental tubercle of, 11, 24
- **Mandible** *(Continued)*
  - mylohyoid groove of, 24
  - mylohyoid line of, 24
  - neck of, 24, 49
  - oblique line of, 13, 24, 81
  - opening of, BP24
  - pterygoid fovea of, 24
  - ramus of, BP24, 11–13, 22, 24, 36, 68
  - retromolar fossa of, 24
  - sublingual fossa of, 24
  - submandibular fossa of, 24
- **Mandibular foramen**, 24, 69
- **Mandibular fossa**, BP29, 13, 17, 21, 25
- **Mandibular nerve**, 9, 19–20, 25, 59–60, 66, 82, 97–98, 115, 132–133, 136, 142, 144–146
  - anterior division of, 59
  - auricular branches of, 133
  - meningeal branch of, 19–20, 59, 97, 133
  - motor root of, 59
  - parotid branches of, 133
  - posterior division of, 59
  - sensory root of, 59
  - superficial temporal branches of, 133
- **Mandibular nodes**, 85
- **Mandibular notch**, BP24, 13, 22, 24
- **Manubriosternal joint**, 193
- **Manubriosternal junction**, 247
- **Manubriosternal synchondrosis**, 408
- **Manubrium**, 245–246, 408
  - of sternum, 32–34, 36, 77, 192, 196, 204
- **Marginal artery**, T5.2, 294–295, 380
  - left, 222
  - right, 222–223
- **Marginal sulcus**, 117
- **Masseter muscle**, T2.6, 32, 36, 49, 53, 55, 60, 68
  - deep part of, 55
  - insertion of, 55
  - superficial part of, 55
- **Masseteric artery**, 55–58, 60, 83
- **Masseteric fascia**, 31
- **Masseteric nerve**, 55–57, 59–60, 82
  - nerve to, 133
- **Mast cell**, BP6
- **Mastication, muscles involved in**, T2.1, 55–56
- **Mastoid cells**, BP34, 12, 14, 49
- **Mastoid angle**, 18
- **Mastoid antrum**, BP27, 107
- **Mastoid canaliculus**, 17, 19
- **Mastoid cells**, BP27, 64, 107
- **Mastoid emissary vein**, 10, 111
  - in mastoid foramen, 19
- **Mastoid fontanelle**, 21
- **Mastoid foramen**, 17, 19–20, 23
- **Mastoid nodes**, 85
- **Mastoid process**, BP29, BP24, 12–13, 17, 22–23, 32, 36–37, 69–70, 182
- **Maturation**, BP91
- **Mature follicle**, BP95, BP92
- **Maxilla**, BP17
- **Maxillary artery**, 25, 41, 47, 55–60, 63, 82–83, 107, 112, 142, 144–145, 147, 149
  - posterior lateral nasal branch of, 57
  - proximal, 58
- **Maxillary bone**, 11, 13, 15, 17, 44–45, 49
  - alveolar process of, BP22, 11, 13, 15, 23, 44, 50
  - anterior nasal spine of, 11, 13, 15, 42, 44–45
  - frontal process of, 11, 13, 42, 44, 94
  - incisive canal of, 15, 44–45
  - incisive fossa of, 17
  - infraorbital foramen of, 11, 13
  - infratemporal surface of, 13
  - intermaxillary suture of, 17
  - nasal crest of, 45
  - nasal surface of, 15
  - of newborn, 21, 52
  - orbital surface of, 11
- **Maxillary bone** *(Continued)*
  - palatine process of, BP29, 15, 17, 23, 43–45, 50, 67, 73
  - tuberosity of, 13, 23
  - zygomatic process of, 11, 17
- **Maxillary nerve**, 9, 20, 46, 59–61, 63–64, 66, 82, 97–98, 115, 132–133, 142, 144–146
  - meningeal branch of, 97, 133
  - nasal branch of anterior superior alveolar branch of, 48
  - posterior superior lateral nasal branch of, 48
  - zygomaticofacial branch of, 133
  - zygomaticotemporal branch of, 133
- **Maxillary ostium**, 64
- **Maxillary sinus**, BP22, 12, 14, 49–51, 62, 64, 96
  - alveolar recess of, BP22
  - growth of, 52
  - imaging of, BP32
  - infraorbital recess of, BP22
  - opening of, BP22, 43–44, 50–51
  - postsynaptic fibers to, 62
  - recesses of, 50
  - transverse section of, 49
  - wall of, 63
  - zygomatic recess of, BP22
- **Maxillary vein**, 84, 99
- **McBurney's point**, 281
- **McGregor's line**, BP19
- **Media, of arterial wall**, BP16
- **Medial, as term of relationship**, 1
- **Medial circumflex femoral vein**, BP107
- **Medial eminence**, 125
- **Medial ligament, of ankle**, 518
- **Medial plantar vein**, BP107
- **Median aperture**, 117, 120, 125, 128
- **Median fissure, anterior**, BP43
- **Median lobe**, BP97
- **Median nerve**, T7.1, 404, 419–421, 423, 425, 436–438, 441, 444, 450, 452, 455, 462–466
  - articular branch of, 466
  - branches of, 455–456
  - common palmar digital branch of, 463
  - communicating branch of, 456
  - palmar branch of, 404, 406, 436–437, 449, 456, 462, 466
  - palmar digital branches of, 404
    - proper, 462–463
  - recurrent branch of, T7.1, 456, 463
- **Median nuclei**, 122
- **Median raphe, of levator ani muscle**, 341
- **Median sulcus, posterior**, BP43, 125
- **Mediastinal lymph nodes**, 7, 245
- **Mediastinal nodes**
  - anterior, pathway to, 190
  - posterior, 242
- **Mediastinal pleura**, 200, 216
- **Mediastinum**
  - anterior, lung area for, 205
  - cross section of, 220
    - anterior, 200
  - lateral view
    - left, 235
    - right, 234
  - of testis, 369, 372
- **Medulla oblongata**, BP35, BP41, 20, 49, 62, 117, 125, 135, 145–146, 173, 306, 321
  - in foramen magnum, 19
  - imaging of, 160
- **Medullary artery, segmental**, 176
- **Medullary lamina**
  - external, 122
  - internal, 122
- **Medullary vein, anteromedian**, 155
- **Medullary velum**
  - inferior, 117, 125
  - superior, 117, 124–125
- **Meiosis**, BP91

Meissner's corpuscle, BP1
Meissner's plexus, BP54. *See also* Submucosal (Meissner's) plexus
Melanocyte, BP1
Membranous labyrinth, 108–109
Membranous (Scarpa's) fascia, BP88
Membranous septum, 225–229
  atrioventricular part of, 220, 224–229
  interventricular part of, 220, 225–229
Membranous urethra, BP93, BP89, 367
Mendelian inheritance, BP91
Meningeal artery, 112
  accessory, 19–20, 57, 60, 112
  anterior, 99
  dorsal, 148
  middle, T2.3, 20, 25, 56–60, 82–83, 107, 111–113, 115, 142, 147–149
    accessory branch of, 107
    branches of, 113
    frontal (anterior) and parietal (posterior) branches of, 112
    left, 147
  posterior, 20
    in mastoid foramen, 19
Meningeal vein, middle, 20, 111, 113
Meningeal vessels
  anterior, groove for, 18
  middle, 19
    groove for, 18
    grooves for branches of, 15–16
  posterior, groove for, 18
Meninges, 20, 111, 113
  arteries to, 147
Meningohypophyseal trunk, 148
  tentorial branch of, 148
Meniscofemoral ligament, posterior, 499–500
Meniscus, BP114, BP5, 445
  articulating surfaces of, BP114
  lateral, 498–500, 502
  medial, T8.1, 498–499
Menstrual cycle, BP92
Mental foramen, 11, 13, 24
Mental nerve, 9, 59, 66, 82, 133
Mental protuberance, 8, 11, 24
Mental region, 2
Mental spine, superior, 69
Mental tubercle, 24
Mental vein, 84
Mentalis muscle, BP20, T2.6, 31, 55, 134
Meridional fibers, 101
Mesencephalic nucleus, of trigeminal nerve, 133, 146
Mesencephalic vein
  lateral, 155
  posterior, 155, 157
Mesenteric artery
  inferior, 4, 271, 295, 311, 313, 316–317, 380, 382–383, 392
  superior, T5.2, BP57, 4, 185, 233, 271, 279–280, 291–295, 297, 303–304, 311, 313, 316–317, 324, 327, 331, 392
Mesenteric ganglion
  celiac, 269
  inferior, 172, 300, 305, 320, 391–392, 396–399
  superior, 172, 269, 300, 303, 305, 320–321, 391–392, 396, 398–399
Mesenteric nodes
  inferior, 266, 268
  superior, BP82, 268
Mesenteric plexus, inferior, 392
Mesenteric vein
  inferior, 241, 271, 288, 298–299, 381
  superior, 241, 278–279, 294, 296–299, 318, 330
Mesentericoparietal recess, 271
Mesentery, 185, 271, 279, 308
  root of, 288, 316, 344, 348
Mesoappendix, BP62, 280, 304
Mesocolic taenia, 280, 283
Mesocolon
  sigmoid, 373
  transverse, 270–271, 273–274, 278, 283, 297
    attachment of, 275
Mesometrium, 355
Mesonephric (Gartner's) duct
  caudal, residua of, 371
  cranial, 371
Mesonephric tubules, 371
  caudal, 371
  cranial, 371
  vestigial, 372
Mesonephric (wolffian) duct, 368, 371
Mesosalpinx, 346, 355
  laminae of, 357
Mesovarium, 353, 355
  laminae of, 357
Metacarpal arteries
  dorsal, 459
  palmar, BP101, 424, 455
Metacarpal bones, BP102, BP104, BP4, 442–446, 448, 454
  fifth, BP105, 434–435, 438, 447
  first, 435, 438, 447, 452, 457
  fourth, 105–106
  second, 105–106, 435
  third, 105–106, 443, 447
Metacarpal ligaments
  deep transverse, BP106, 448, 455
  dorsal, BP102
  palmar, BP102, 448
  superficial transverse, 406, 449
Metacarpal veins
  dorsal, 406, 458
  palmar, BP99
Metacarpophalangeal ligaments, 448
Metacarpophalangeal (MP) joint, BP102, 448
Metaphyseal bone, BP114, BP5
Metaphysis, nutrient branches to, 460–461
Metatarsal arteries, dorsal, BP110, BP115, 512, 521–522, 527
  anterior perforating branches to, 526
Metatarsal bones, BP117, BP4, 515–516, 519, 527
  fifth, 509–510, 528
    tuberosity of, 526–528
  first, 509, 518, 528
  tuberosity of, 520
Metatarsal ligaments
  deep transverse, 519, 527
  dorsal, 518, 527
  plantar, 527
  transverse, superficial, 523
Metatarsal veins, dorsal, 473
Metatarsophalangeal (MTP) joint, 519
  first, T8.1
Metopic suture. *See* Frontal (metopic) suture
Midbrain, imaging of, 160
Midcarpal joint, 443, 445
Middle colic nodes, BP82
Middle sacral node. *See* Promontorial nodes
Midline groove, 71
Midpalmar space, 450–451, 453
Minimus muscle, T8.1, 486
Minute fasciculi, 449
Mitochondria, 11–12
Mitral cell, 130
Mitral heart valve. *See* Atrioventricular valve, left
Modiolus, 31
Molar teeth, 73–74
  growth of, 52
Monocytes, BP15, BP6
Mons pubis, 358
Morison's pouch. *See* Hepatorenal recess (Morison's pouch)
Motor (autonomic) nerve, BP1
Motor nucleus, 133
  of trigeminal nerve, 146
Mucosa
  of ileum, 279
  of intestine, 308
  of jejunum, 279
Mucous glands, 71
  innervation of, 173
Müllerian duct, 371. *See also* Paramesonephric (Müllerian) duct
Müller's muscle. *See* Tarsal (Müller's) muscle, superior
Multifidus lumborum muscle, 182
Multifidus muscle, T3.2, 185
Multifidus thoracis muscle, 182
Muscles, BP8. *See also specific muscles*
  of arm
    anterior views of, 421
    posterior views of, 422
  of back
    deep layer, 182
    intermediate layers, 181
    superficial layers, 180
  contracted, BP8
  of dorsum of foot, 521
  of eye, T2.1
  of face, facial expression, T2.1, 31, 68
    anterior view of, BP20
  of facial expression, T2.1, 31, 68
  fascicles of, BP8
  fiber of, BP8
  of forearm
    anterior, T7.1
    attachments of, 439–440
    deep layer, 435, 438
    extensors of wrist and digits, 431
    flexors of digits, 433
    flexors of wrist, 432
    intermediate layer, 437
    posterior, T7.1
    rotators of radius, 430
    superficial layer, 434, 436
  of hip, 484–485
  hypothenar, BP105, 447, 449–450, 453, 467
  intercostal, BP56, 188, 204, 221, 245–247, 258
  lumbrical, T8.5, T7.4, 105–106, 450–455, 466–467, 524–525, 527
  of mastication, T2.1, 55–56
  of neck
    anterior view of, 32
    infrahyoid and suprahyoid, 35
    lateral view of, 36
    scalenus and prevertebral, 37
  of pharynx
    lateral view of, 81
    medial view of, 78
    partially opened posterior view of, 75
  relaxed, BP8
  of sole of foot
    second layer, 525–526
  table, 32–33
Muscular artery, 103–104
Muscular branches. *See* Sural branches
Muscular system, T3.1, T6.1, T4.1, BP8, T5.1
Muscular vein, 103
Muscularis mucosae, 308, 375
  of anal canal, 375–376
  of rectum, 376
Musculocutaneous nerve, 419–421, 423, 425, 438, 462–466
  anterior branch of, 465
  articular branch of, 465
  posterior branch of, 465
  terminal part of, 404

Musculophrenic arteries, 195–196, 204, 215, 258
Musculophrenic vein, 195–196, 259
Musculus uvulae, T2.1, T2.9, 67
Myelin sheath, BP11
Myenteric (Auerbach's) plexus, 308
Mylohyoid artery, 57
  nerve to, 69
Mylohyoid groove, 24
Mylohyoid line, 24
Mylohyoid muscle, BP22, T2.6, 32, 34–36, 38, 41, 50, 53, 59, 68–70, 77–78, 81
  nerve to, 56, 59, 68–69, 82, 133
Mylohyoid nerve, 25, 57
Myofibril, BP8
Myofilaments, BP8
Myometrium, of uterus, 379

N

Nail bed, 460–461
Nail body, 461
Nail fold
Nail matrix, 460–461
Nail root, 460–461
Nares, 8
  anterior, 8
Nasal artery
  external, 10, 42, 57, 83, 99, 149
  lateral, 42
Nasal bone, BP17, 8, 11–13, 15, 42, 44–45, 50
  of newborn, 21, 52
Nasal cartilage, accessory, 42
Nasal cavity, BP26, BP22, BP44, 52, 95
  arteries of, 47
  autonomic innervation of, 62
  bones of, 52
  floor of, 43
  lateral wall of, 43–44, 46
  medial wall of, 45
  nerves of, 46, 48
  postsynaptic fibers to, 62
Nasal concha
  inferior, BP22, 11–12, 15, 43–44, 49, 51, 79, 95
    ethmoidal process of, 44
    growth of, 52
  middle, BP22, 11, 15, 43–44, 51, 95
    growth of, 52
  superior, 43–44
Nasal concha turbinate
  inferior, 50
  middle, 50
Nasal meatus
  highest, lower border of, 52
  inferior, BP22, 43, 50, 95
  middle, BP22, 50
    atrium of, 43
    opening into, 51
  superior, 43, 52
    lower branch of, 52
Nasal nerve
  external, 42
  posterior, 144
Nasal region, 2
Nasal retinal arteriole
  inferior, 103
  superior, 103
Nasal retinal venule
  inferior, 103
  superior, 103
Nasal septal cartilage, 42, 45, 49
  lateral process of, 42, 44–45
Nasal septum, BP22, 12, 23, 46–48, 50, 77, 79
  growth of, 52
  schematic hinge of, 47–48
Nasal slit, 20
Nasal spine
  anterior, BP17, 11, 13, 15, 42, 45
  posterior, 17
Nasal turbinates, BP44
Nasal vein, external, 10, 84
Nasal vestibule, 43–45, 49
Nasalis muscle, BP21, T2.6, 31, 134
  alar part of, BP20, 31, 42
  transverse part of, BP20, 31, 42
Nasion, BP17, 11
Nasociliary nerve, BP26, 61, 97–98, 132–133, 142–143
Nasofrontal vein, 10, 84, 99
Nasolabial lymph nodes, 85
Nasolacrimal canal, opening of, 44
Nasolacrimal duct, 95
  opening of, 43, 95
Nasolacrimal foramen, of newborn, 52
Nasopalatine nerve, 46, 48, 62–63, 66
  groove for, 45
  in incisive fossa, 19
Nasopalatine vessels, groove for, 45
Nasopharyngeal adenoids, 34–35
  imaging of, 160
Nasopharynx, BP44, BP28, 77, 79, 105, 115
  airway to, 43
Navicular bones, 515–516, 518, 527, 535
  tuberosity of, 519, 522, 527
Navicular fossa, 349, 367
Neck, 8–160
  autonomic nerves in, 141
  bony framework of, 22
  cutaneous nerves of, 9, 38
  fascial layers of, 33
  lymph vessels and nodes of, 85
  muscles of
    anterior view of, 32
    infrahyoid and suprahyoid, 35
    lateral view of, 36
  nerves of, 39–40, 82
  posterior triangle of, 194
  of scapula, 192
  superficial veins of, 38
  surface anatomy of, 8
  triangle of, 184
    posterior, 180
  vessels of, 39–40
Nephron, BP77
Nerve fiber bundles, BP12
Nerve fibers, 109
Nerves. *See also specific nerves*
  of abdominal wall
    anterior, 260
    posterior, 269
  of back, 183
  of buttocks, 493
  of cranial base, 64
  of deep face, 63
  of esophagus, 243
  of external genitalia
    female, 395
    male, 391
  of head, 82
    regions, 82
  of hip, 493
  of larynx, 92
  of nasal cavity, 46, 48
  of neck, 39–40
    regions, 39–40, 82
  of orbit, 97
  of perineum
    female, 395
    male, 393
Nervous system, T6.2, T3.1, T5.2, T4.1
  general organization of, 6
Nervus spinosus, 60
Neural foramen. *See* Intervertebral foramen
Neuroendocrine G cell, BP60
Neurofilaments, BP11
Neuroforamina; *See* Intervertebral (neural) foramen
Neurons, BP11
Neurotubules, BP11
Neurovascular compartment, 425
Neurovascular sheath, 347. *See also* Hypogastric (neurovascular) sheath
Neutrophils, BP15
Newborn, skull of, 21
Nipple, 187–188, 333
Node of Cloquet/Rosenmüller, 268
Node of Ranvier, BP12
Nose, 42
  ala of, 8
  innervation of, 173
  transverse section of, 49
Nostril, 8
Nuchal ligament, BP19, 29, 161
Nuchal line
  inferior, 17, 23
  superior, 17, 23, 180
Nucleus ambiguus, 127–128, 136–138
Nucleus pulposus, 28, 164, 168
Nutrient artery, of femur, 495
Nutrient foramen, of femur, 479

O

Obex, 125
Oblique cord, 429
Oblique fibers, 497
Oblique fissure, of lungs, 204
  left, 205
  right, 205
Oblique line, 24, 90
Oblique muscle
  external, BP58, BP109, T5.3, 85–86, 249, 252–258, 260–263, 265, 312, 330
    abdominal, BP47, 180–181, 183, 185, 187–188, 194, 197, 333, 359, 362–363
    aponeurosis of, BP58, 253–255, 260, 262, 264, 312
    aponeurotic part, 252
    muscular part of, 252
  inferior, T2.5, 96, 98, 132
    tendon of, 98
  internal, BP86, BP109, T5.3, 253–258, 260, 262–263, 265
    aponeurosis of, 254–255, 260
  internal abdominal, BP47, 180–181, 185, 194
    in lumbar triangle (of Petit), 180
    tendon of origin of, 185
  superior, BP26, T2.8, 96–98
Oblique popliteal ligament, 499, 501
Obliquus capitis inferior muscle, T3.2, 181–182, 184
Obliquus capitis superior muscle, T3.2, 181–182, 184
Obturator anastomotic, 267
Obturator artery, BP98, BP108, 266, 317, 346–347, 380, 382, 384–385, 392, 400, 477, 495, 503
  accessory, 380, 384
  acetabular branch of, 477, 495
  anterior branch, 477
  posterior branch, 477
Obturator canal, 338–340, 342, 346–347, 350, 384, 491
Obturator crest, 338, 476
Obturator externus muscle, T8.5, 401, 480–481, 483, 491, 530
Obturator fascia, 339–340, 342, 346, 353, 360, 384, 393
  over obturator internus muscle, 350

Obturator foramen, 250, 334, 476, 478, 534
  radiograph of, 335
Obturator groove, 476
Obturator internus fascia, 347, 374
Obturator internus muscle, T8.5, BP109, T6.3, 256, 265, 339–343, 350, 352–353, 365, 374, 380, 384, 393, 395, 400–401, 480–481, 485, 489, 492–494, 534
  nerve to, 487, 489, 492–493
  sciatic bursa of, 494
Obturator internus tendon, BP109, 341, 343
Obturator membrane, 338, 353, 477
Obturator nerve, T8.2, 256, 264, 269, 382, 392, 400, 486–488, 496, 529–530
  accessory, 269, 487–488
  adductor hiatus, 530
  anterior branch of, 491, 530
  articular branch of, 530
  cutaneous branch of, 473–474, 491, 530
  posterior branch of, 491, 530
Obturator node, 388
Obturator vein, 267, 298, 381, 400
Obturator vessels, 256
  accessory, 262, 264
  right, BP98
Occipital artery, 10, 41, 76, 83–84, 112, 147, 149, 184
  descending branch of, 41, 184
  groove for, 17
  mastoid branch of, 112, 147
  medial, 153
  meningeal branch of, 10
  sternocleidomastoid branch of, 41
Occipital bone, BP17, 13–18, 29, 169–170
  basilar part of, 15, 17–18, 29, 37, 43–45, 67, 72, 75, 78–79
  clivus of, 18
  condylar canal and fossa of, 17
  condyle of, 18
  foramen magnum of, 15, 17
  groove
    for inferior petrosal sinus, 15, 18
    for occipital sinus, 18
  hypoglossal canal of, 15, 17
  jugular foramen of, 15
  jugular process of, 37
  of newborn, 21
  nuchal line of
    inferior, 17
    superior, 17
  occipital crest of
    external, 17
    internal, 18
  occipital protuberance of
    external, 15, 17
    internal, 18
  pharyngeal tubercle of, 17, 77
  posterior meningeal vessels of, groove for, 18
  superior sagittal sinus of, groove for, 18
  transverse sinus of, groove for, 15, 18
Occipital condyle, BP29, 15, 17, 23, 37, 139
  lateral mass for, superior articular surface of, 26
  superior articular surface for, 26
Occipital crest
  external, 17, 23
  internal, 18
Occipital nerve
  greater, 9, 140, 183–184
  lesser, 9, 39–40, 140, 183–184
  third, 9, 183–184
Occipital nodes, 85
Occipital pole, of cerebrum, 116, 118
Occipital (posterior) horn, 120
Occipital protuberance
  external, 13–15, 17, 23, 161
  internal, 18
Occipital region, 3
Occipital sinus, 114
  groove for, 18
Occipital sulcus, transverse, 116
Occipital vein, 10, 84
  internal, 157
Occipitofrontalis muscle
  frontal belly of, T2.4, 31, 42, 98, 134
  occipital belly of, 31, 134, 184
Occipitomastoid suture, 23
Occipitotemporal gyrus
  lateral, 117–118
  medial, 117–118
Occipitotemporal sulcus, 117–118
Oculomotor nerve (CN III), T2.2, BP40, 60, 96–98, 115, 124, 127–128, 142, 155
  distribution of, 129
  inferior branch of, BP26, 97, 132
  innervation of, 173
  schema of, 132
  superior branch of, BP26, 97, 132
  in superior orbital fissure, 20
Oculomotor nucleus, 127–128, 132
Odontoid process, of C2, BP35
Olecranon fossa, 410, 426–427
Olfactory bulb, BP22, 46, 50, 118, 130
  contralateral, 130
Olfactory bulb cells, 130
Olfactory cells, 130
Olfactory mucosa, 130
  distribution of, 46
Olfactory nerve (CN I), T2.2, 20, 46, 48
  distribution of, 129
  schema of, 130
Olfactory nerve fibers, 130
Olfactory nucleus, anterior, 130
Olfactory stria
  lateral, 130
  medial, 130
Olfactory sulcus, 118
Olfactory tract, 46, 117–118, 124, 130
Olfactory tract nucleus, lateral, 130
Olfactory trigone, 130
Olfactory tubercle, 130
Oligodendrocyte, cell body of, BP12
Olivary complex, inferior, 128
Olive, 124
Omental bursa, 274, 324
  cross section of, 274
  stomach reflected, 273
  superior recess of, 284, 324
Omental (epiploic) appendices, 272, 283
Omental foramen, 273–274, 276, 285, 324
Omental taenia, 280, 283
Omental veins, 241
Omentum
  greater, 270, 272, 283, 285, 331
  lesser, 285, 324
    anterior layer of, 287–288, 301
    posterior layer of, 301
    right free margin of, 278
    window cut in, 285
Omohyoid muscle, T2.7, 33, 35, 38, 69, 194, 204, 409, 413, 416, 419
  inferior belly of, 8, 35–36, 39, 139–140
  phantom, 41
  superior belly of, 32, 35–36, 38, 139–140
Oogenesis, BP91
Oogonium, BP91
Operculum
  frontal, 116
  parietal, 116
  temporal, 116
Ophthalmic artery, T2.2, 20, 57, 64, 99, 143, 147–149, 151, 154
  continuation of, 99
  in optic canal, BP26
Ophthalmic nerve, 9, 59–61, 64, 66, 97–98, 115, 132, 142–146
  frontal branch of, 20
  lacrimal branch of, 20
  nasociliary branch of, 20
  tentorial (recurrent meningeal) branch of, 97, 133
Ophthalmic vein
  inferior, 99, 104
  superior, BP26, 20, 84, 99, 104, 115
Opponens digiti minimi muscle, T7.5, 452, 455, 467
Opponens pollicis muscle, T7.5, 452, 455–456, 466
Optic canal, 11, 15, 20
Optic chiasm, BP22, BP30, 50, 115, 117–118, 124, 131, 148, 151–152, 156–158
  imaging of, 160
Optic disc, BP26, 103
Optic nerve (CN II), BP22, 20, 50, 64, 96–98, 100, 103, 115, 117–118, 143, 154–155
  distribution of, 129
  internal sheath of, vessels of, 104
  left, 148
  meningeal sheath of, 97, 100, 104
  in optic canal, BP26
  right, 148
  schema of, 131
Optic nerve tract, imaging of, BP32
Optic radiation, 131
Optic tract, 50, 118–119, 123–124, 131, 150, 155
Ora serrata, 100, 102–103
Oral cavity, BP22, BP44, BP9, 45, 50, 77
  afferent innervation of, BP25, 66
  floor of, 69
  inspection of, 65
  roof of, 67
Oral region, 2
  arteries of, 83
  veins of, 84
Orbicularis oculi muscle, T2.7, BP21, 31, 134
  orbital part of, 20–21, 31
  palpebral part of, 20–21, 31, 94
Orbicularis oris muscle, 20–21, 31, 42, 55, 68, 134
Orbit, T2.1, 51
  anterior view of, 98
  arteries of, 99
  fasciae of, BP26
  growth of, 52
  medial wall of, BP22, 50
  nerves of, 97
  right, frontal and slightly lateral view of, 11
  superior view of, 98
  surface of, 11
  veins of, 99
Orbital fat, BP22
Orbital fat body, BP26
Orbital fissure
  inferior, BP26, BP17, 11, 13, 23
  superior, BP26, BP17, 11–12, 20
Orbital gyri, 118
Orbital muscles, BP22
Orbital plate, of newborn, 21
Orbital process, of palatine bone, 11
Orbital region, 2
Orbital septum, 94
Orbital sulcus, 118
Oropharynx, BP44, 33, 72, 77, 79, 237
Orthotonic stomach, BP60
Osseous cochlea, 109
Osseous spiral lamina, 108–109
Osteoblasts, active, BP7
Osteocytes, BP7
Osteoid, BP7
Ostium, of auditory tube, BP44

Otic capsule, 109
Otic ganglion, 25, 56, 59–60, 107, 133–134, 136, 142, 144–146, 173
  schema of, 145
Ova, BP95
Ovarian artery, 382, 394, 397. *See also* Testicular artery
  uterine, 386
Ovarian cycle, BP92
Ovarian hormone, BP92
Ovarian plexus, 394, 397
Ovarian vein, 267, 382. *See also* Testicular vein
Ovarian vessels, 316, 344, 347, 386
  tubal branches of, 386
Ovaries, BP95, T6.2, BP10, 316, 344–346, 353, 355, 371, 382, 394, 397
  blood vessels, BP95
  corpus albicans of, 355
  corpus luteum of, 355
  follicle (graafian), 355
  infant, BP95
  left, 356
  ligaments of, 344, 356, 371
    proper, 345–346, 353–355
    suspensory, 344–347, 355–357, 371, 382
  right, 356–357
Ovum, BP95, 91–92
  stages of, BP95

P

Pacinian corpuscle, BP1
Pain, referred visceral, sites of, BP13
Palate
  growth of, 52
  innervation of, 173
  postsynaptic fibers to, 62
  uvula of, 65, 72, 75, 79
Palatine aponeurosis, 67, 78
Palatine artery
  ascending, 57, 72, 83
    tonsillar branch of, 72
  descending, 63–64, 83
  greater, 47, 57, 63–64, 67
  lesser, 47, 57, 63–64, 67, 72
    tonsillar branch of, 72
Palatine bone, 15, 17, 44
  horizontal plate of, BP29, 11, 17, 23, 43–45, 67, 73
  nasal crest of, 45
  nasal spine of, posterior, 17, 44–45
  of newborn, 21, 52
  orbital process of, 11, 44
  palatine foramen of
    greater, 17, 45
    lesser, 17, 45
  perpendicular plate of, 11, 44–45
  pyramidal process of, 17, 21, 23
  sphenoidal process of, 44
Palatine fold, transverse, 67
Palatine foramen
  greater, 19, 44, 47, 67, 73
  lesser, 19, 44, 47, 67, 73
Palatine gland, 67, 72, 77
Palatine nerve, 46, 144
  descending, 144
  greater, 46, 48, 62–64, 67, 82, 133, 142, 144
    in greater palatine foramen, 19
    posterior inferior lateral nasal branch of, 46, 48, 142
  lesser, 46, 48, 62–64, 67, 82, 133, 142, 144
    in lesser palatine foramen, 19
Palatine process, 15, 23
Palatine raphe, 67
Palatine tonsil, 65, 67–68, 71–72, 77, 79
Palatine vein, 84
  external, 84
Palatine vessels
  greater, 19
  lesser, 19
Palatoglossal arch, 65, 71–72
Palatoglossus muscle, T2.7, 67, 70–72, 137
Palatomaxillary suture, 17
Palatopharyngeal arch, 65, 71–72, 79
Palatopharyngeal ridge, 78
Palatopharyngeus muscle, T2.7, 67, 70–72, 75, 78, 80, 137
Palm, 443
Palmar aponeurosis, 406, 432, 436, 444, 449–450, 453
Palmar arch, 4
  carpal, 455
  deep, BP101, BP99, 424, 455
  superficial, BP101, BP99, 424, 452, 456, 463
Palmar digital veins, 5
Palmar ligament, 448, 451, 454, 460–461
Palmar longus muscle, 438
Palmar plate, BP106
Palmar region, 2
Palmar venous arches, 5
Palmaris brevis muscle, T7.5, 449, 467
Palmaris longus muscle, T7.5, 432, 436, 439, 441, 466
Palmaris longus tendon, 402, 436–437, 441, 444, 449–450, 452
Palpebral arterial arches
  inferior, 99
  superior, 99
Palpebral artery
  lateral, 99
    inferior, 99
    superior, 99
  medial, 99
    inferior, 99
    superior, 99
Palpebral conjunctiva, BP26, 94
  inferior, 94
  superior, 94
Palpebral ligament
  lateral, BP26
  medial, BP26, 94
Pampiniform (venous) plexus, T6.2, BP98, 259, 369
Pancreas, BP38, BP56, T5.1, BP9, 137, 173, 185, 274, 276, 323–324, 329
  autonomic innervation of, 310
  body of, 273, 276, 288
  head of, 273, 276, 278–279, 287, 327
    arteries of, 293
    as site of referred visceral pain, BP13
  innervation to, 172
  lymph vessels and nodes of, BP80
  in situ, 288
Pancreatic arteries, 291
  dorsal, 290–291, 294
  great, 291
  inferior, 291, 293–294
Pancreatic duct, BP62, BP87, BP67, 287–288
  accessory (of Santorini), 279, 288
  sphincter of, 287
  variations in, 67–68
  of Wirsung, 279
Pancreatic islets, BP10
Pancreatic pain, areas of referred pain in, 310
Pancreatic tail, BP87, 273, 289, 291
Pancreatic veins, 296, 298
  great, 296
Pancreaticoduodenal arteries
  anterior
    inferior, 291, 293, 303
    superior, 273, 290–291, 293–294, 303
  inferior, 291, 293–295, 304
  posterior
Pancreaticoduodenal arteries *(Continued)*
    inferior, 291, 293, 303
    superior, 290–291, 293, 303
Pancreaticoduodenal vein
  anterior
    inferior, 296, 298
    superior, 296, 299
  posterior
    inferior, 296, 298
    superior, 296, 299
Papilla, 74
  keratinized tip of, 71
Papillary muscle, 220, 248
  inferior, 224–225, 227
    anterior, 229
    left, 228
    right, 228
  septal, 227–228
  superoposterior, 224–225, 227
    anterior, 229
    left, 228
    right, 228
Parabrachial nucleus, 146
Paracentral artery, 152–153
Paracentral lobule, 117
Paracentral sulcus, 117
Paracolic gutter
  left, 272, 344, 348
  right, 272, 280, 344, 348
Paracolic nodes, BP82
Paradidymis, 371
Paraduodenal fossa, 271
Parahippocampal gyrus, 117–119, 130
Parallel fibers, 497
Paramesonephric (Müllerian) duct, 371
Paranasal sinuses, 21–22
  bones of, 52
  changes with age, 52
  coronal section of, 50
  innervation of, 173
  sagittal view of, 51
  transverse section of, 50
Pararectal fossa, 344, 346, 348, 374
Pararenal fat, 185
Paraspinal muscle, BP38
Parasternal lymph nodes, 190–191
Parasympathetic fibers, 309
  of autonomic reflex pathways, 307
  of kidneys and upper ureters, 321
  of lower ureter, 399
  postsynaptic, BP41
  presynaptic, BP41
  in reproductive organs, 397
    male, 398
  of tracheobronchial tree, 214
  of urinary bladder, 399
Parasympathetic nervous system, BP40
  general topography, BP40
  schema of, 173
Parathyroid gland, BP10, 76, 89
  inferior, 88–89
  superior, 88–89
Paratracheal lymph nodes
  left, 212
  right, 212
Paratracheal nodes, 242
Paraumbilical veins, T5.2, 299
  in round ligament of liver, 259
  tributaries of, 259
Paraurethral glands, primordium of, 371
Paraurethral (Skene's) ducts, BP90
  openings of, 358
Paraurethral (Skene's) gland, 371
Paravertebral anastomoses, 177
Paravesical endopelvic fascia, 352
Paravesical fossa, 346
Parental generation, BP91

Parietal artery, 10
  anterior, 152–153
  posterior, 152–153
Parietal bone, BP17, 11, 13–18
  mastoid angle of, 18
  middle meningeal vessels of, groove for, 18
  of newborn, 21
  tuber (eminence) of, 21
Parietal emissary vein, 10, 111
Parietal foramen, 16
Parietal lobule, superior, 116
Parietal nodes, posterior, 242
Parietal peritoneum, BP84, 264, 272, 274–275, 309, 324, 332, 344, 348
Parietal pleura
  cervical, 202–203, 234
  costal part of, 199–200, 204, 210, 215, 235
    left border, 203
    right border, 203
  costal pleura, 234
  diaphragmatic part of, BP44, 199–200, 204, 210, 215, 236
  mediastinal part of, BP44, 199–200, 204, 210, 215–216, 219–220, 235–236
Parietal region, 3
Parietal vein, 10
Parietooccipital sulcus, 116–117
Paroöphoron, 371
Parotid duct (of Stensen), 53–56, 83
Parotid fascia, 31
Parotid gland, BP41, T2.1, BP40, 32, 36, 38, 49, 53–54, 60, 68, 79, 105, 136, 145, 173
  accessory, 53
  innervation to, 172
Parotid lymph node, superficial, 85
Parotid space, 41
Parous introitus, BP96
Pars distalis, 158
Pars flaccida, 106
Pars interarticularis, 164
Pars intermedia, 158
Pars tensa, BP27, 106
Pars tuberalis, 158
Parturition, neuropathways in, 396
Passavant's ridge, 78
Patella, BP4, 113–114, 471, 482–484, 491, 497–498, 502, 510–511
  articular surface of, BP114
Patellar anastomosis, BP110, BP108, 490–491
Patellar ligament, T8.1, 471, 482–484, 491, 497–499, 502, 505, 510–512
  insertion of, BP111
Patellar nerve plexus, 473
Patellar retinaculum
  lateral, 482, 484, 497–498, 510–512
  medial, 482–483, 491, 497–499, 511–512
Patellar tendon, BP113
Pecten, 375
Pecten pubis, 250, 334, 338, 476
Pectinate (dentate) line, 375
Pectinate ligament, 101
Pectinate muscles, 224
Pectineal fascia, 254
Pectineal ligament (Cooper's), 253–254, 256, 262, 264–265
Pectineus muscle, T8.5, BP109, 400–401, 480–483, 490–491, 495–496, 529
Pectoral fasciae, 188, 416
Pectoral girdle, BP4
Pectoral lymph nodes, 190–191
Pectoral nerve
  lateral, 194, 416, 419–420
  medial, 194, 419–420
Pectoral region
  anterior, 2
  lateral, 3
Pectoralis major muscle, T4.3, T7.5, 32, 36, 38, 187–188, 191, 194–195, 197, 204, 220–221, 244–249, 252–254, 402, 408–409, 414, 416, 419, 421, 423, 425
  abdominal part of, 413
  clavicular head of, 187, 413
  pectoral fasciae and, 188
  sternal head, 187
  sternocostal head of, 413
Pectoralis major tendon, 423, 425
Pectoralis minor muscle, T4.3, T7.5, 194–195, 204, 221, 245–247, 409, 414, 416, 419, 423
Pectoralis minor tendon, 414, 417, 419, 421
Pedicle, BP33, 163, 167–168
  of C5, BP34
  cervical, 27
  of L1, BP36
  of L3, BP37
  of L4, 165
  lumbar, 164
  thoracic, 163
Pedis artery
  dorsal, BP110, 503, 521–522
    medial tarsal branch of, BP110
  dorsalis, BP115
Pelvic brim, 353
  sacral part of, 166
Pelvic cavity, BP3
  contrast medium in, 357
Pelvic diaphragm, 349
  fascia of, 378
  female, 339–341
  inferior fascia of, 359–360, 364, 374, 376, 387
  levator ani muscle of, 345, 364, 373–374, 378
  male, 342–343
  superior fascia of, 347, 350, 359, 374, 376
Pelvic fascia, tendinous arch of, 347, 352
Pelvic floor, T6.1
Pelvic foramina, anterior, 342
Pelvic girdle, BP4
Pelvic outlet, measurements of, 336
Pelvic plexus
  inferior, 391–392, 394, 396–399
  superior, 391
  uterovaginal, 397
Pelvic sacral foramina. *See* Sacral foramina, anterior
Pelvic splanchnic nerves, BP41, 487
  S2-4, BP40
Pelvic surface, 166
Pelvic viscera
  female, 345–346
    nerves of, 394
  male, 349
    nerves of, 392
Pelvis, 333–401
  arcus tendineus fasciae, 354
  bones and ligaments of, 337–338
  bony framework of, 334
  electronic bonus plates in, BP97, BP92, BP93, BP96, 88–89
  female
    arteries of, 382–383
    contents, 344
    diaphragm, 339–341
    fasciae of, BP88
    lymph nodes of, 388
    lymph vessels of, 388
    measurements of, 336
    radiograph of, 335
    relationships, 356
    urethra, 401
    vagina, 401
    veins of, 382
    viscera, 345
  greater, 338
  lesser, 338
Pelvis *(Continued)*
  ligaments of, 357
  linea terminalis of, 347–348
  male
    arteries of, BP98, 385
    bladder-prostate gland junction, 400
    contents, 348
    diaphragm, 342–343
    fasciae of, BP88
    lymph nodes of, 390
    lymph vessels of, 390
    measurements of, 336
    radiograph of, 335
    veins of, BP98, 385
    viscera of, 349
  sagittal T2-weighted MRIs in, 379
  surface anatomy of, 333
Penile fascia, superficial, BP88
Penile urethra, BP93
Penis, 364, 379
  arteries of, T6.2
  body (shaft) of, 333, 370
  bulb of, 364–365, 367
    artery of, 365, 387
  cavernous nerves of, 392, 398
  corpora cavernosa of, 364–365
  crus of, 352, 363–364, 367
  Dartos fascia of, 349, 362–364, 369
  deep arteries of, 363, 365, 367, 387
  deep (Buck's) fascia of, BP88, BP98, 252–254, 324, 349, 362–365, 369, 377–378, 387
  dorsal arteries of, 363, 365, 383, 387
    deep, BP98, 387
    left, 385
  dorsal nerves of, 363, 365, 387, 391–393, 395, 398, 487, 493
  dorsal veins of
    deep, BP98, 342–343, 349, 363, 365, 383, 385
    superficial, BP98, 252, 259, 333, 363, 385
  fundiform ligament of, 262
  glans, 333, 349, 364, 370
    corona, 364
    neck, 364
  ligament of
    fundiform, 349
    suspensory, 349
  raphe of, 370
  skin of, 362–364, 369
  superficial fascia of, 253–254
  suspensory ligament of, BP58, 253
Perforated substance
  anterior, 118, 124, 130
  posterior, 118
Perforating artery
  first, 492
  fourth, 492
  second, 492
  third, 492
Perforating branches, 491
  anterior, 527
  posterior, 527
Perforating cutaneous nerves, 393, 395
Perforating radiate artery, 314
Perforating veins, BP99, 405–406, 513
  anterior, 198
Perianal skin, 376
  sweat glands in, 375
Perianal space, 374–375, 378
Perianal tissues, 370
Pericallosal artery, 152–153
Pericardiophrenic artery, 196, 210, 215–216, 220, 234–235, 258
  left, 199–200
  right, 199

- **Pericardiacophrenic vein**, 196, 210, 215–216, 220, 234–235
  - left, 200
  - right, 200
- **Pericardiacophrenic vessels**, 219
- **Pericardial cavity**, BP3, 220
- **Pericardial reflection**, 218, 224–225
- **Pericardial sac**, 219
  - oblique, 219
- **Pericardial sinus**
  - oblique, 219–220, 248
  - transverse, BP51, 216, 219, 224–225
- **Pericardium**, T4.2, BP44, T4.1, 33, 200, 210, 215–216, 219, 236
  - bare area of, 202
  - central tendon covered by, 200
  - diaphragmatic part of, 219
  - sternocostal part of, 219
- **Perichoroidal space**, 100–101
- **Pericranium**, 113
- **Pericyte**, BP6
- **Periglandular plexus**, 308
- **Periglomerular cell**, 130
- **Perimysium**, BP8
- **Perineal artery**, BP98, 353, 361, 385–387
  - transverse, 387
- **Perineal body**, BP88, T6.1, 343, 349–351, 359–360, 364–366, 373, 377, 387
- **Perineal compartment, superficial**, 378
- **Perineal fascia**, BP88
  - deep, BP90, 349, 352–353, 359–360, 363–365, 373, 377–378
    - transverse, 366
  - superficial, BP90, 349, 352–353, 359–365, 373, 377–378, 386–387, 393
- **Perineal ligament, transverse**, 340, 342, 347, 349–350, 359, 365, 387
- **Perineal membrane**, BP88, BP98, BP90, 256, 265, 324, 339, 343, 345, 349–350, 352–353, 359–361, 363–366, 373, 377, 386–387, 393, 395, 399
  - anterior thickening of, 350, 365
- **Perineal muscles**
  - deep, 373
    - fascia of, 340
  - transverse
    - deep, 339, 345, 349, 360–361, 365–366, 378, 385–386
    - superficial, T6.4, 339, 359–361, 363–365, 373, 377–378, 386–387
    - superior, 387
- **Perineal nerves**, 361, 374, 392–393, 395, 487, 493
  - deep, 393
    - branches of, 361, 393, 395
  - superficial, 393
    - branches of, 361, 393, 395
- **Perineal pouch**
  - deep, with endopelvic fascia, BP88
  - superficial, BP88
- **Perineal raphe**, 358, 370
- **Perineal region**, 2
- **Perineal spaces**
  - deep, 361
  - male, 365
  - perineal, 386
  - superficial, 349, 353, 359–361, 363–364, 386–387
- **Perineal vein**, 387
- **Perineopelvic spaces**, 378
- **Perineum**, 333–401
  - arteries of, 386
  - deep, 360
  - electronic bonus plates in, BP88, BP95, BP98, BP94, 90–91
  - female, 345, 358, 360
    - fasciae of, BP88

- **Perineum** *(Continued)*
    - lymph nodes of, 389
    - lymph vessels of, 389
    - nerves of, 395
    - superficial dissection, 359
  - interdigitating fibers of, 341
  - male, 348, 362–363
    - arteries of, 387
    - fasciae of, BP88
    - nerves of, 393
    - veins of, 387
  - surface anatomy of, 333
  - veins of, 386
- **Perineurium**, BP12
- **Periodontium**, 74
- **Periorbita**, BP26
- **Periosteal vessels**, BP7
- **Periosteum**, BP7
- **Peripheral arteries**, BP41
- **Peripheral nerve, features of**, BP12
- **Peripheral nervous system**, 6
- **Periportal arteriole**, 286
- **Periportal bile ductule**, 286
- **Periportal space**, 286
- **Perirenal fat**, 185
- **Perisinusoidal spaces**, 286
- **Peritoneal cavity**, 271–272
- **Peritoneal reflection**, 373, 375
- **Peritoneal vessels, testicular vessels in**, 348
- **Peritoneum**, BP88, BP59, T6.1, 185, 239, 255–256, 263, 283, 304, 311, 323, 345, 359, 374, 382, 394
  - inferior extent of, 397–398
  - paravesical pouch, 353
  - parietal, BP84, 264, 272, 274–275, 309, 324, 332, 348–350, 352
  - uterus through overlying, 356
  - visceral, 274
- **Perivascular fibrous (Glisson's) capsule**, 285
- **Permanent teeth**, 73–74
- **Peroneal nerve, deep**, BP116
- **Peroneal retinaculum**. *See* Fibular retinaculum, superior
- **Peroneus brevis muscle**, BP116. *See also* Fibularis brevis muscle
- **Peroneus brevis tendon**, BP116
- **Peroneus longus muscle**. *See* Fibularis longus muscle
- **Peroneus longus tendon**, 116–117
- **Peroneus tertius tendon**, BP116
- **Perpendicular plate**, 11, 15
- **Pes anserinus**, 480, 482–483, 497–498
- **Petit, lumbar triangle of**, 161, 180
  - internal oblique muscle in, 180
- **Petropharyngeus muscle**, 75
- **Petrosal artery, superficial, descending branch of**, 107
- **Petrosal nerve**
  - deep, 46, 62, 134, 136, 142, 144
  - greater, BP27, 19–20, 60, 62, 64, 97, 136, 142, 144
    - in foramen lacerum, 19
    - groove for, 18, 110
    - hiatus for, 20
    - from intermediate nerve, 134
  - lesser, 19–20, 59–60, 97, 106, 133–134, 136, 145
    - groove for, 18
    - hiatus for, 20
- **Petrosal sinus**
  - inferior, 20, 114–115
    - groove for, 15, 18
  - superior, 110, 114–115
    - groove for, 15, 18
- **Petrosal vein**, 115, 155
- **Petrosquamous fissure**, 21
- **Petrotympanic fissure**, 17, 19

- **Peyer's patches (aggregate lymphoid nodules)**, 279
- **Phalangeal bones**, 448
  - foot, BP4, 516
    - distal, 515, 519
    - middle, 515, 519
    - proximal, 515, 519
  - hand
    - distal, BP4, 446–448, 460–461, 466
    - middle, BP102, BP4, 446–448, 460–461
    - proximal, BP102, BP105, BP4, BP106, 446–448
- **Pharyngeal aponeurosis**, 75, 78, 80
- **Pharyngeal artery**, 57, 63
  - ascending, 41, 57, 64, 76, 83, 107, 147, 149
    - meningeal branch of, 20, 112, 147
    - pharyngeal branch of, 72
    - tonsillar branch of, 72
- **Pharyngeal constrictor muscle**, 77, 92
  - inferior, T2.5, 36, 75, 78, 80–81, 88–89, 92, 137, 237–238
    - cricopharyngeal part of, 80, 237–238
  - middle, T2.6, 36, 70, 72, 75, 78, 80–81, 88, 137
  - superior, T2.8, 56–57, 67–68, 70, 72, 75, 78, 80–81, 83, 88, 137
    - glossopharyngeal part of, 70, 78
- **Pharyngeal nerve**, 144
- **Pharyngeal nervous plexus**, 76
- **Pharyngeal plexus**, 136–137, 141–142
- **Pharyngeal raphe**, 43, 72, 75, 77–78, 88, 238
- **Pharyngeal recess**, 43, 49, 72, 79
- **Pharyngeal region**
  - arteries of, 83
  - veins of, 84
- **Pharyngeal tonsil**, 43, 45, 72, 75, 77, 79
- **Pharyngeal tubercle**, 17, 29, 45, 72, 75, 78
- **Pharyngobasilar fascia**, 67, 70, 75, 78, 81, 86
- **Pharyngoepiglottic fold**, 75, 80
  - fibers to, 78
- **Pharyngoesophageal constriction**, 237
- **Pharyngoesophageal junction**, 80
- **Pharynx**, BP44, BP9
  - afferent innervation of, BP25, 66
  - lymph vessels and nodes of, 86
  - lymphatic drainage of, 86
  - medial view of, 77
  - muscles of
    - lateral view of, 81
    - medial view of, 78
    - partially opened posterior view of, 75
  - opened posterior view of, 79
  - posterior view of, 76, 88
  - posterior wall of, 65
  - zone of sparse muscle fibers, 80–81, 88
- **Philtrum**, 8, 65
- **Phrenic arteries, inferior**, 236, 240, 266, 273, 290, 300–301, 322–323, 392
  - left, 243
- **Phrenic ganglion**, 201
- **Phrenic lymph nodes, inferior, pathway to**, 190
- **Phrenic nerve**, T4.1, 33, 37–40, 82–83, 87, 141, 195–196, 199, 204, 210, 215–216, 220, 230, 234–236, 299, 417, 419–420
  - anterior branch of, 201
  - left, 199–201, 219, 235
    - inferior, 201
  - pericardial branch of, 199
  - phrenicoabdominal branches of, 199
  - right, 199–200, 219, 246, 322
    - inferior, 201
- **Phrenic nodes, superior**, 242
- **Phrenic plexus**, 300–301, 322
- **Phrenic veins, inferior**, 267, 311
  - left, 241
- **Phrenicocolic ligament**, 273

- **Phrenicoesophageal ligament**, 239
- **Pia mater**, 111, 113, 177
  - overlying spinal cord, 174
- **Pial plexus**, 176
  - arterial, 177
    - peripheral branches from, 177
  - venous, 178
- **PICA**. *See* Posterior inferior cerebellar artery
- **Pigment cells**, 131
- **Pillar (rod) cells**, 109
- **Pilosebaceous unit**, BP2
- **Pineal body**, 121
- **Pineal gland**, BP10, 117, 122, 124–125
- **Pineal recess**, 117
- **Piriform cortex**, 130
- **Piriform recess**, 79, 91
- **Piriformis muscle**, T8.1, T8.5, T6.3, 265, 339–342, 384, 392–395, 480, 485, 489, 492–494
  - bursa of, 494
  - left, 385
  - nerve to, 487, 489
  - tendon of, 494
- **Pisiform bone**, BP102, 432, 436–438, 442–450, 452, 455
- **Pisohamate ligament**, BP102, 444
- **Pisometacarpal ligament**, BP102, 444
- **Pituitary gland**, BP10, 115, 117–118, 158
  - anterior lobe (adenohypophysis) of, BP30, 151, 158
  - cleft of, 158
  - imaging of, 160
  - posterior lobe (neurohypophysis) of, BP30, 151, 158
- **Pituitary stalk, imaging of**, 160
- **Pivot joint**, BP5
- **Plane joint**, BP5
- **Plantar aponeurosis**, T8.1, 520, 523, 525, 535
  - digital slips of, 523
  - lateral band of, 523
  - origin of, BP116
- **Plantar arch**, BP110, BP115, 503, 527
  - deep, 522
  - perforating branches from, posterior, 512
- **Plantar arterial arch, deep**, 526
- **Plantar artery**
  - deep, BP110, 503, 512, 521, 527
  - lateral, BP116, 509, 513, 520, 525–527
    - deep branch of, BP117
    - plantar metatarsal branch of, 524
    - superficial branch of, BP117
  - medial, BP116, 509, 513, 520, 523, 525–526
    - deep branch of, BP117, 525–526
    - superficial branch of, 523–526
- **Plantar calcaneocuboid ligament**, 519
- **Plantar calcaneonavicular ligament**, 518, 527
- **Plantar digital arteries**, 521–523, 527
  - common, BP115, 525, 527
- **Plantar digital nerves**
  - common, 525, 532
  - proper, 532
- **Plantar fascia**
  - lateral, 523
  - medial, 523
- **Plantar interosseous muscle**, T8.5, 526
- **Plantar ligaments**, 519, 527
  - of foot, 519
  - long, 518, 527
  - short, 518
- **Plantar metatarsal arteries**, BP115, 524, 526–527
  - perforating branches from, 522
- **Plantar metatarsal ligaments**, 519
- **Plantar nerve**
  - lateral, 115–117, 513, 520, 525–526, 531–532
    - deep branch of, 525–526
    - plantar cutaneous branches of, 474
- **Plantar nerve** *(Continued)*
    - plantar digital branches of, 524
    - proper plantar digital branches of, 525–526
    - superficial branch of, 525–526
  - medial, BP116, 509, 513, 520, 523, 525–526, 531–532
    - deep branches of, BP117, 526
    - plantar cutaneous branches of, 474
    - plantar digital branches of, 524
    - proper plantar digital branches of, 525–526
    - superficial branches of, 526
- **Plantar vein**
  - lateral, BP107
  - medial, BP107
- **Plantar venous arch**, BP107
- **Plantarflexion, of lower limbs movements**, 472
- **Plantaris muscle**, T8.5, 481, 484–485, 492, 497, 501–502, 506–509, 513, 531–532
- **Plantaris tendon**, BP116, BP111, 485, 507–508, 513–514
- **Plasma, composition of**, BP15
- **Plasma cell**, BP6
- **Plasma proteins**, BP15
- **Platelets**, BP15
- **Platysma muscle**, T2.7, 20–21, 31–33, 38, 134
- **Pleura**, 177, 205
  - visceral, BP49
- **Pleural cavity**, BP3, 220
  - costodiaphragmatic recess of, 202–203, 234–235
  - costomediastinal recess of
    - left, 200
    - right, 200
- **Pleural reflection**, T4.1, 202–204
- **Plica semilunaris**, 94–95
- **Polar body**, BP91
- **Pons**, BP35, 117, 124–125, 145–146
  - imaging of, BP32, 160
- **Pontine arteries**, 150–151, 154
  - basilar and, 152
- **Pontine vein**
  - lateral, 155
  - transverse, 155
- **Pontomesencephalic vein, anterior**, 155
- **Pontoreticulospinal tract**, BP43
- **Popliteal artery**, BP110, BP108, 4, 492, 503, 507–509, 513
  - of knee, in deep popliteal region, T8.2
  - pulses at, 4
- **Popliteal fossa**, 3, 471
- **Popliteal ligament**
  - arcuate, 499, 501–502
  - oblique, 502
- **Popliteal vein**, BP107, 5, 475, 492, 507–508, 513
- **Popliteal vessels**, 485
- **Popliteus muscle**, T8.5, BP111, 481, 485, 501–502, 506, 508–509, 513–514, 532
  - nerve to, 532
- **Popliteus tendon**, 499–500
  - origin of, 498
- **Porta hepatis**, 284
- **Portacaval anastomoses**, 299
- **Portal arteriole**, 286
- **Portal space, limiting plate of**, 286
- **Portal triad**, 285, 288, 329
- **Portal vein**, BP57, 329
  - branch of, 286
- **Postanal space**
  - deep, 378
  - superficial, 378
- **Postcentral gyrus**, 116
- **Postcentral sulcus**, 116
- **Posterior chamber**
  - of eye, 94, 100, 102–103
  - of eyeball, 101
- **Posterior cord**, 414
- **Posterior cutaneous branches**, 183
- **Posterior horn**. *See* Occipital (posterior) horn
- **Posterior inferior cerebellar artery (PICA)**, 176
- **Posterior plane**, 1
- **Posterior ramus**, 177
- **Posterior root**, 144
  - rootlets of, 174
- **Posterior root ganglion**, 197, 399. *See also* Spinal sensory (posterior root) ganglion
- **Posterior sacral foramen**, BP86
- **Posterior tibial artery, pulses at**, 4
- **Posterior tibial veins**, BP107
- **Postganglionic fibers**
  - of lower ureter, 399
  - in reproductive organs, 397
    - male, 398
  - of urinary bladder, 399
- **Postnatal circulation**, 233
- **Postsynaptic cell**, BP11
- **Postsynaptic membrane**, BP11
- **Poupart's ligament**, 249, 252–254, 262–265, 333, 340. *See also* Inguinal ligament (Poupart's)
- **Preaortic nodes**, 390
- **Precentral gyrus**, 116
- **Precentral sulcus**, 116
- **Prechiasmatic groove**, 18
- **Preculminate vein**, 155
- **Precuneal artery**, 153
- **Precuneus**, 117
- **Prefrontal artery**, 150, 152
- **Preganglionic fibers**
  - of lower ureter, 399
  - in reproductive organs, 397
    - male, 398
  - of urinary bladder, 399
- **Premolar teeth**, 73–74
- **Prenatal circulation**, 233
- **Preoccipital notch**, 116
- **Prepatellar bursa, subcutaneous**, 502
- **Prepontine cistern**, 120
- **Prepuce**, 349, 370
- **Preputial gland**, 364
- **Prepyloric vein**, 296, 298
- **Presacral fascia**, 347, 378
- **Presacral space**, 347, 378
- **Presternal region**, 2
- **Presymphyseal node**, 390
- **Presynaptic membrane**, BP11
- **Pretracheal fascia**, 77
  - visceral layer of, 208
- **Pretracheal lymph nodes**, 87
- **Pretracheal space**, 34
- **Pretracheal (visceral) fascia**, 33
- **Prevertebral anastomoses**, 177
- **Prevertebral fascia**, 68, 77
- **Prevertebral soft tissue**, BP34
- **Prevesical fascia, umbilical**, 350
- **Prevesical plexus**, 390
- **Prevesical space**, 349–350. *See also* Retropubic (prevesical) space
  - fat in, 343
  - of Retzius, 378
- **Primary oocyte**, BP91
- **Primary ova**, BP95
- **Primary spermatocytes**, BP93, BP91
- **Primordial follicles**, BP95
- **Princeps pollicis artery**, BP101, 424
- **Procerus muscle**, T2.7, 20–21, 31, 42, 134
- **Processus vaginalis**, 368
- **Profunda brachii artery**, BP100, 417, 419, 422–425
- **Profunda femoris artery**, BP108, 483, 490–491, 495–496, 503
  - perforating branches of, BP108

Profunda femoris vein, 496
Profundus flexor tendons, 453
Progesterone, BP92
Promontorial nodes, 319, 388, 390
Promontory, BP28, 105
  sacral, 166, 334
    measurements of, 336
Pronator quadratus muscle, T7.5, 430, 438–439, 441, 453, 455, 466
Pronator teres muscle, T7.5, 409, 421, 423, 430, 435–441, 463, 466
Prostate, BP97, T6.1, BP109, 379
Prostate gland, BP41, 173, 256, 349, 352, 365–367, 371, 373, 385, 400
  apex of, 366
  base of, 366
  branch to, BP98
  capsule of, BP97, 352
  central zone of, 366
  innervation to, 172
  lymphatic drainage from, 390
  peripheral zone of, 366
  primordium of, 371
  transitional zone of, 366
Prostatic ducts, 366–367
Prostatic lobules, BP93
Prostatic plexus, T6.2, 320, 392, 398–399
Prostatic sinuses, BP97, 366–367
Prostatic urethra, BP97, BP93, BP89, 352, 367, 400
Prostatic utricle, BP97, 366–367, 371
Prostatic venous plexus, 385
Proximal, as term of relationship, 1
Proximal interphalangeal (PIP) joint, BP102, 402, 447–448
Proximal palmar crease, 402
Psoas minor tendon, 265
Psoas muscle, BP38, 400, 486, 495
  major, T5.3, 85–86, 185, 201, 262, 265–267, 269, 278, 311–312, 344, 347–348, 382, 482, 486, 488–489, 529
    nerves to, 487
  minor, T5.3, 265, 344, 348, 486
    nerves to, 487
  muscular branches to, 488
Psoas tendon, 400
Pterion, T2.1, 13
Pterygoid artery, 57
  lateral, 57
  medial, 57
Pterygoid canal
  artery of, 57, 63–64, 107, 148
  nerve (vidian) of, 46, 48, 61–62, 64, 107, 133–134, 136, 142, 144, 146
Pterygoid fossa, 23
Pterygoid fovea, 24
Pterygoid hamulus, BP29, 13, 15, 23, 56, 59, 67, 72, 78
  of newborn, 52
Pterygoid muscle
  lateral, 24–25, 49, 55–59
    inferior head of, BP24, 34, 60
    nerve to, 82, 133
    superior head of, BP24, 60
  medial, T2.6, 49, 56–57, 59–60, 67–68, 75, 82
    nerves to, 133
Pterygoid nerve, medial, 56
Pterygoid plate
  lateral, BP29, 22–23, 49, 56, 81
  medial, BP29, 23, 56, 67, 72, 78
    hamulus of, 22
    right, 64
Pterygoid plexus, 60, 84, 99
  deep facial vein from, 10
Pterygoid process, 17, 23
  hamulus of, 13, 17, 23
  lateral plate of, 13, 15, 17, 23
Pterygoid process *(Continued)*
  medial plate of, 15, 17, 23
    of newborn, 52
  pterygoid fossa of, 17
  scaphoid fossa of, 17
Pterygoid venous plexus, T2.2
Pterygomandibular raphe, 22, 56–57, 67–68, 72, 78, 81
Pterygomaxillary fissure, 13
Pterygopalatine fossa, 13, 23, 51
Pterygopalatine ganglion, BP40, 46, 48, 61–64, 82, 132–134, 136, 142, 144, 146, 173
  branches to, 61
  pharyngeal branch of, 46
  posterior and superior lateral nasal branches of, 142
  posterior superior lateral nasal branches from, 46
  schema of, 144
Pubic arch, 250, 334
  measurements of, 336
Pubic bone, 324, 339–340, 351, 365, 379, 401
Pubic branch, 347
Pubic crest, 262
Pubic ligament, inferior (arcuate), 334, 340–343, 347, 349–350, 359, 365
Pubic ramus, T6.1
  inferior, 250, 334, 341, 345, 352, 476–478, 486, 534
  superior, 250, 334, 337–338, 345, 349, 364, 476–478, 486, 489, 534
    radiograph of, 335
Pubic symphysis, T6.1, 249–250, 262, 265, 333–334, 337, 340–341, 343, 345, 347, 349–350, 356, 359, 361–362, 365, 384, 401
  measurements of, 336
  radiograph of, 335
  superior portion of, 400
Pubic tubercle, BP58, 249–250, 253–254, 262, 265, 333–334, 337–338, 343, 359, 364, 476, 482–483, 534
Pubic vein, 267
Pubis, 476
  body of, 400
  radiograph of, 335
  superior ramus of, 342, 483
  symphyseal surface of, 394
Puboanalis (puborectalis) muscle, T6.3, 324, 341–343, 373, 377
  left, 339
Pubocervical fascia
  distal portion of, 354
  horizontal portion of, 354
Pubococcygeus muscle, T6.3, 339–341, 343, 353, 377
Pubofemoral ligament, BP109, 477
Puboprostatic ligament, medial, 347, 350
Puborectalis muscle, 341–343, 373. *See also* Puboanalis (puborectalis) muscle
  left, 339
Pubovesical ligament
  lateral, 347
  median, 350
Pudendal artery
  deep external, 258, 266
  external
    deep, BP108, 503
    superficial, BP108, 258, 266, 503
  internal, BP98, 266, 317, 361, 365, 380, 384–387, 400, 489
    in pudendal canal (Alcock's), 386
Pudendal canal (Alcock's), 374, 380–381, 387, 393
  pudendal artery, internal, 384, 386
  pudendal nerve of, 395
    internal, 387
  pudendal vessels, internal, 387
Pudendal cleft, 358
Pudendal nerve, T6.2, 169, 269, 306, 361, 374, 392–400, 487, 489, 492–493
  internal, 401
  nerve to, 489
  in pudendal canal, 395
Pudendal vein
  external, BP107, 259
    superficial, 473
  internal, 298, 381, 385, 400
Pudendal vessels
  external, 385
    deep, 383, 490
    superficial, 252, 254, 267, 383
  internal, 374, 401
  superficial, 490
Pudendum, 358
Pulmonary arteries, BP50, T4.2, BP49, T4.1
  left, 56–57, 205, 210, 216–217, 225, 233, 235, 244, 247
  right, 56–57, 205, 210, 216, 218, 224–225, 233–234, 244, 247–248
Pulmonary heart valve, 224, 229
  anterior semilunar cusp of, 224, 226
  left semilunar cusp of, 224, 226
  right semilunar cusp of, 224, 226
Pulmonary (intrapulmonary) lymph nodes, 212
Pulmonary ligament, 205, 212, 234–235
Pulmonary plexus, 39–40, 137, 214, 243
  anterior, 213
  posterior, 213
Pulmonary trunk, BP57, 210, 216–217, 219, 221, 224, 228–229, 233, 244, 247
  outflow to, 228
Pulmonary veins, 217
  inferior
    left, 205, 218, 220
    right, 205, 218, 220, 224
  left, 210, 218–219, 225, 228, 233, 235
  right, BP50, BP57, 210, 219, 225, 229, 233–234, 244
  septum of, BP49
  superior
    left, 205, 216, 218, 225
    right, 205, 216, 218, 224, 228
Pulses, 4
  brachial artery, 4
  carotid artery, 4
  dorsalis pedis artery, 4
  facial artery, 4
  femoral artery, 4
  popliteal artery, 4
  posterior tibial artery, 4
  radial artery, 4
  ulnar artery, 4
Pulvinar, 118, 121–122, 124–125
  left, 155
  right, 155
  of thalamus, 150, 154, 156
Pupil, 94
Purkinje fibers
  of left bundle, 229
  of right bundle, 229
Pyloric canal, 329
Pyloric glands, BP60
Pyloric orifice, 279
Pyloric zone, 277
Pylorus, 276, 278, 329
Pyramidal eminence, BP27, 106–107
Pyramidal process, 17, 21, 23
Pyramidal tract. *See* Lateral corticospinal tract
Pyramidalis muscle, T5.3, 254, 262
Pyramids, 124
  decussation of, 124–125

Q

- **Quadrangular space**, 417
- **Quadrate ligament**, 428
- **Quadrate tubercle**, 479
- **Quadratus femoris muscle**, T8.5, 395, 480–481, 483, 485, 491–494
  - nerve to, 487, 489, 493
- **Quadratus lumborum fascia**, 185
- **Quadratus lumborum muscle**, T5.3, 182, 185, 201, 265–267, 269, 311–312, 344, 348, 486, 488
- **Quadratus plantae muscle**, T8.5, 116–117, 525–526, 532
- **Quadratus plantae nerve**, 532
- **Quadriceps femoris muscle**, 480, 529
- **Quadriceps femoris tendon**, 471, 482, 491, 497–498, 502, 510, 512
- **Quadriceps muscle**. *See* Rectus femoris muscle
- **Quadriceps tendon**, BP113
- **Quadrigeminal cistern**, 120
  - imaging of, BP32

R

- **Radial artery**, BP100, T7.2, BP101, 4, 423–424, 435–438, 441, 444, 450, 452, 455–457, 459–460
  - dorsal carpal branch of, 457
  - palmar carpal branch of, 438, 455
  - pulses at, 4
  - superficial palmar branch of, BP101, 424, 437–438, 444, 450, 455–456
- **Radial collateral ligament**, BP102, 428
- **Radial fossa**, 409, 426
- **Radial groove**, 410
- **Radial longitudinal crease**, 402
- **Radial metaphyseal arcuate ligament, dorsal**, 445
- **Radial nerve**, T7.1, 404, 414, 417, 419–420, 422, 425, 437–438, 462–466, 468–469
  - communicating branches of, 458
  - deep branch of, 437, 441, 463, 469
  - dorsal digital branches of, 457, 462, 469
  - dorsal digital nerves from, 404
  - inferior lateral brachial cutaneous nerve from, 404
  - lateral branch of, 457
  - medial branch of, 457
  - posterior brachial cutaneous nerve from, 404
  - superficial branch of, 404, 406, 434, 437, 441, 458–459, 462–464, 469
- **Radial recurrent artery**, 100–101, 423, 437–438
- **Radial styloid process**, 442
- **Radial tubercle, dorsal**, 442
- **Radial tuberosity**, 421, 427
- **Radial vein**, BP99, 5
- **Radialis indicis artery**, BP101, 424
- **Radiate ligament, of head of rib**, 193
- **Radiate sternocostal ligament**, 193, 408
- **Radicular artery**
  - anterior, 176–177
  - posterior, 177
- **Radicular vein**, 178
  - segmental
    - anterior, 178
    - posterior, 178
- **Radiocarpal joint**, 443, 445
  - articular disc of, 443, 445
- **Radiocarpal ligament**
  - dorsal, BP102, 445
  - palmar, BP102
- **Radiolunate ligament**
  - long, 444
  - palmar, 444
  - short, 444
- **Radioscaphocapitate ligament**, 444
- **Radioulnar joint, distal**, 445
- **Radioulnar ligament**
  - dorsal, BP102, 445
  - palmar, BP102
- **Radius**, BP102, BP4, T7.1, 426–433, 435, 438–445, 447, 455, 460
  - anterior border of, 429
  - anterior surface of, 429
  - anular ligament of, 428
  - articular surface of, 447
  - head of, 421, 426–427, 429
  - interosseous border of, 429
  - lateral surface of, 429
  - neck of, 426–427, 429
  - posterior border of, 429
  - posterior surface of, 429
  - rotators of, 430
  - styloid process of, 429, 447
  - tuberosity of, 426
- **Rami communicantes**, 396, 487
- **Rathke's pouch, vestigial remnant of**, 52
- **Recombinant chromatids**, BP91
- **Rectal artery**
  - inferior, BP98, 295, 380, 384–387
  - middle, BP98, 266, 295, 316, 347, 380, 382, 384–385
  - superior, 266, 295, 300, 305–306, 316, 347, 380, 382, 392
- **Rectal canal**, 375
- **Rectal fascia**, BP88, 346–347, 359, 366, 373–376, 378
- **Rectal nerves, inferior**, T6.2, 361, 392–393, 395–396
- **Rectal plexus**, 305, 320, 322, 392, 394
  - external, 381
  - internal, 381
  - perimuscular, 381
  - superior, 392
- **Rectal veins**, T6.2
  - inferior, 298–299, 381
  - middle, 267, 298–299, 381
  - superior, T5.2, 298–299, 381
- **Rectal venous plexus**, 267
  - external, 298, 376
    - in perianal space, 375
  - internal, 375–376
  - perimuscular, 298, 381
- **Rectalis muscle**, 377
- **Rectocervical spaces**, 346
- **Rectococcygeus muscle**, 265
- **Rectoprostatic (Denonvilliers') fascia**, 324, 343, 349, 366, 373
- **Rectosigmoid arteries**, 380
- **Rectosigmoid junction**, 283, 373, 375–376
- **Rectourethralis superior muscle**, 343
- **Rectouterine fold**, 346
- **Rectouterine pouch, of Douglas**, T6.1, 345–346, 355–356, 373
- **Rectouterine (sacrouterine) ligament**, 346
- **Rectovaginal spaces**, 346–347
- **Rectovesical fascia**, 366, 378
- **Rectovesical pouch**, 324, 348–349, 373
- **Rectovesical space**, 378
- **Rectum**, BP88, T6.1, BP109, 173, 265, 272, 283, 311, 324, 339–341, 344–345, 347–350, 356, 359, 366, 373, 379, 382, 394, 401
  - ampulla of, 350
  - arteries of, 380
  - circular muscle of, 376
  - innervation to, 172
  - longitudinal muscle of, 376
  - muscularis mucosae of, 376
  - radiology of, 165
  - in situ
    - female, 373
    - male, 373
- **Rectum** *(Continued)*
  - transverse folds of, 375
  - veins of, 381
- **Rectus abdominis muscle**, BP47, BP109, T5.3, 187, 194–195, 197, 249, 253–256, 258, 261–262, 324, 333, 344, 347–349, 359, 379
- **Rectus capitis muscle**
  - anterior, T2.7, 37, 49, 86
  - lateral, T2.7, 37
  - posterior
    - major, T3.2, 181–182, 184
    - minor, T3.3, 181–182, 184
- **Rectus femoris muscle**, T8.5, BP109, 400–401, 471, 480–482, 484, 490–491, 496, 529. *See also* Quadriceps femoris muscle
- **Rectus femoris tendon**, 471, 482–483, 498, 511
- **Rectus muscle**
  - inferior, 25–26, 96, 98, 132
    - branches to, 97
  - lateral, 25–26, 50, 96–98
    - check ligament of, BP26
    - tendon of, 100
  - medial, BP26, 50, 96–98, 132
    - branches to, 97
    - check ligament of, BP26
    - tendon of, 100
  - superior, BP26, T2.8, 96–98
    - tendon of, 104
- **Rectus sheath**, 252–253, 359
  - anterior layer of, BP58, 194, 253–255, 260, 262, 349
  - cross section of, 255
  - posterior layer of, 254–255, 258, 260, 262
- **Recurrent artery**
  - of Heubner, 150–153
  - tibial
    - anterior, BP110, BP108, 503, 512
    - posterior, BP110, 503, 509
- **Recurrent process**, 130
- **Red blood cells**, BP15, BP6
- **Red nucleus**, 118, 127–128
- **Referred pain, visceral, sites of**, BP13
- **Reinforcing fibers**, 287
- **Reissner's membrane**. *See* Vestibular (Reissner's) membrane
- **Renal artery**, 4, 317, 321, 382, 399
  - left, 266, 292, 305, 323, 392
  - right, 266, 292, 300, 303, 310, 313
  - in situ, 313
  - variations in, BP75
- **Renal column (of Bertin)**, 314
- **Renal corpuscle, histology of**, BP76
- **Renal cortex**, 278, 330
- **Renal (Gerota's) fascia**, 185, 318, 323, 331
  - anterior layer of, 318
  - posterior layer of, 318
  - transverse section of, 318
- **Renal ganglion**, 320–322, 398–399
- **Renal impression**, 284, 289
- **Renal plexus**, 320–322, 399
  - left, 392
- **Renal segments**, 315
- **Renal vein**, 5, 317, 324, 382
  - left, 241, 267, 323, 327
  - right, 241, 267, 310, 313
  - in situ, 313
  - variations in, BP75
- **Renal vessels**, 383
- **Reproduction, genetics of**, BP91
- **Reproductive organs, innervation of**
  - female, 397
  - male, 398
- **Reproductive system**, T6.1
  - male, BP93

Respiration
  muscle attachment of, BP46
  muscles of, BP47
Respiratory bronchioles, 48–49
Respiratory diaphragm, BP62, BP56, T4.3, BP47, BP44, T4.1, BP3, T5.3, 196, 204, 210, 213, 215, 217, 221, 234, 236–237, 239–241, 255, 258, 265, 267, 273–274, 276, 284, 289, 311–312, 325, 328, 488
  abdominal surface of, 201
  central tendon of, 201, 265
  costal origin of, slips of, 196
  costal part of, 201
  crura of, 185
    left, 201, 236, 265, 271
    right, 201, 236, 271
  dome of
    left, 202–203
    right, 202–203
  esophageal hiatus of, T5.1
  lumbar part of, 201
  sternal part of, 196, 201
  thoracic surface of, 200
Respiratory system, BP44, T4.1
Rete testis, BP93
Reticular fibers, BP6
  in arterial wall, BP16
Reticular nuclei, 122
Retina
  ciliary part of, 100–101
  optic (visual) part of, 100, 102
  structure of, 131
Retinacula cutis, BP1
Retinacular arteries, 495
Retinal artery, 103
  central, 99–100, 103–104
Retinal vein, 103
  central, 100, 103–104
Retrobulbar fat, BP26, 50
Retrocecal recess, 272, 280
Retrodiscal tissue (bilaminar zone), BP24
  inferior layer of, BP24
  upper layer of, BP24
Retromandibular vein, 10, 38–39, 49, 53, 68, 70, 84, 99
  anterior branch, 39
  posterior branch, 39
Retromolar fossa, 24
Retroperitoneal space, 356
Retropharyngeal nodes, 86
Retropharyngeal space, 33–34, 77–78
Retroprostatic fascia, 378
Retropubic (prevesical) space, 324, 347, 349–350
  fat in, 254, 343
  of Retzius, 378
Retropubic venous plexus. *See* Vesical (retropubic) venous plexus
Retrotonsillar vein, superior, 155
Retzius, retropubic space of, 254
Rhinal sulcus, 117–118
Rhomboid major muscle, T3.3, T7.5, 180, 183, 186, 197, 245, 247, 257, 410, 413, 468
Rhomboid minor muscle, T3.3, T7.5, 180, 183, 410, 413, 468
Rhomboid muscle, 246
Ribs, BP4, T4.1, 246–247, 274
  angle of, 192–193
  associated joints and, 193
  body, 192
  costal groove of, 193
  eight, 192, 220
  eleventh, 192
  false, 192
  fifth, 192, 217
Ribs *(Continued)*
  first, BP34, BP57, 22, 28, 37, 87, 169, 192, 198, 202–203, 215, 234–236, 408, 419–420
    costal cartilage of, 245
    lung groove for, 205
  floating, 192
  fourth, 192
  head of, 192–193
    intraarticular ligament of, 193
    radiate ligament of, 193
  left, T4.1
  muscle attachment of, BP46
  neck of, 192–193
  ninth, 192
    posterior of, BP36
  radiate ligament of, BP33
  second, 34, 188, 192, 408
  seventh, 163, 192, 248
  sixth, 188, 192
    posterior view of, 193
  superior articular facet on, BP33
  tenth, 192
  third, 192, 217
  true, 192
  tubercle of, 192–193
  twelfth, 169, 180, 192, 201, 486
    radiology of, 165
Right bundle
  Purkinje fibers of, 229
  subendocardial branches of, 229
Right lateral region, 251
Risorius muscle, T2.7, 20–21, 31
Rod cells. *See* Pillar (rod) cells
Rods, 131
Root ganglion, posterior, 139, 143
Rotation, of lower limbs movements, 472
Rotator cuff muscles, T7.1, 415
Rotatores cervicis muscle, 182
  brevis, 182
  longus, 182
Rotatores muscle, T3.3
Rotatores thoracis muscle, 182
  brevis, 182
  longus, 182
Rotter's lymph nodes, 190–191. *See also* Interpectoral (Rotter's) lymph nodes
Round ligament, 357
  of artery, 382
  of liver, 256, 276, 284, 299
  of uterine artery, 386
  of uterus, BP90, 344–346, 352–354, 356, 359, 371, 382
Round window. *See* Cochlear (round) window
Rubrospinal tract, BP43
Rugae, 277. *See also* Gastric folds (rugae)
Ruptured follicle, BP95, BP92

S

Saccule, 108–109, 135
Sacral arteries
  lateral, BP98, 176, 266, 317, 384–385
    spinal branches of, 176
  median, 266, 293, 295, 317, 347, 380, 384–385
Sacral canal, 166, 342
Sacral cornu, 166
Sacral crest
  intermediate, 166
  lateral, 166
  median, 166, 339
Sacral foramina, BP37
  anterior, 166, 337, 342
    radiograph of, 335
  posterior, 166, 337
Sacral ganglion, 1st, 172
Sacral hiatus, T3.1, 166
Sacral kyphosis, 162
Sacral nerve, perineal branch of, 487, 489
Sacral nodes
  lateral, 268, 388, 390
  middle, 268, 388, 390
Sacral plexus, 169, 321, 392, 397–399, 489
Sacral promontory, BP86, 250, 334, 337–338, 340, 345–346, 348, 394
  measurements of, 336
Sacral region, 3
Sacral spinal nerves
  S1, 169
    anterior ramus, 392, 396
    dermatome of, 171
    vertebral body of, 379
  S2, dermatome of, 171
  S3, dermatome of, 171
  S4, dermatome of, 171
  S5, 169
    dermatome of, 171
Sacral splanchnic nerves, BP39, 172
Sacral sympathetic trunk, 305
Sacral tuberosity, 166
Sacral veins
  lateral, 267
  median, 298, 381, 385
Sacral vessels, median, BP98, 346, 382
Sacrococcygeal ligaments
  anterior, 337, 340, 342, 347
  lateral, 167, 337–338
  posterior, 167, 337–338
Sacrogenital fold, 348, 374. *See also* Vesicosacral (sacrogenital) fold
Sacroiliac joint, BP86, 342, 478
  measurements of, 336
  radiograph of, 335
  radiology of, 165
Sacroiliac ligaments
  anterior, 337
  posterior, 167, 337–338
Sacrospinous ligament, 167, 337–339, 341, 343, 392, 395, 485, 493
Sacrotuberous ligament, BP109, 167, 337–339, 341, 343, 360, 377, 384, 392–393, 395, 400, 485, 492–493
Sacrouterine ligament, 346. *See also* Rectouterine (sacrouterine) ligament
Sacrum, BP4, 161–162, 166–167, 169–170, 250, 334, 341–342, 379
  ala of, radiograph of, 335
  apex of, 166
  arteries of, 176
  articular facet for, 164
  auricular surface for, 167, 476
  base of, 166
  radiology of, 165
Saddle joints, BP5
Sagittal plane, 1
Sagittal sinus
  inferior, 111, 114–115, 155–157
  superior, 111–115, 117, 120, 155–156
    emissary vein to, 20
    groove for, 16, 18
    imaging of, 31–32, 159
Sagittal suture, BP17, 12, 16, 21
Salivary gland, BP9, 53, 68
  lingual minor, 65
  molar minor, 67
  sublingual, 68
  submandibular
    deep lobe, 68
    superficial lobe, 68
Salivatory nucleus
  inferior, 127–128, 136, 145
  superior, 62, 127–128, 134, 144
Salpingopharyngeal fold, 72, 79

- **Salpingopharyngeus muscle**, T2.7, 72, 75, 78, 137
- **Saphenous nerve**, BP115, BP111, 473, 490–491, 512, 529, 532
  - branches of, 474
  - great, 496, 514
  - infrapatellar branch of, 473, 490–491, 511–512, 529
  - medial crural cutaneous of, 529
  - small, 492
- **Saphenous opening**, BP58, 253, 259, 359, 362, 473
  - cribriform fascia and, BP58, 259, 475
  - falciform margin of, 264
- **Saphenous veins**, T8.2
  - accessory, BP107, 473–474
  - great, BP107, BP116, BP111, BP58, 252–253, 259, 267, 362, 471, 473–475, 513–514
  - greater, 116–117, 401
  - lesser, BP116
  - small, BP107, 471, 473–475, 507, 513–514
- **Sarcolemma**, BP8
- **Sarcomere**, BP8
- **Sarcoplasm**, BP8
- **Sartorius muscle**, T8.5, BP109, 400–401, 471, 480–482, 484–485, 490–491, 496–497, 501, 507, 529
  - insertion of, 511
- **Sartorius tendon**, 482–483, 497–498
  - insertion of, BP111, 512
- **Satellite cell**, BP8
- **Scala tympani**, 108–109
- **Scala vestibuli**, 109
- **Scalene lymph nodes, inferior**, 212
- **Scalenus muscle**, 32, 35–37, 417
  - anterior, BP56, T2.7, 33, 36–40, 46–47, 82–84, 87, 195–196, 199, 204, 210, 215, 221, 234–236, 417–419
  - innervation of, 420
  - medius, T2.7, 33, 36–37, 39, 46–47, 82–84, 195, 417
  - posterior, BP56, T2.7, 33, 36–37, 46–47, 195, 236, 417
- **Scalp**, 10, 31
  - arteries of, T2.2
  - skin of, 31
  - superficial arteries and veins of, 10
  - superficial fascia of, 31
- **Scaphocapitate ligament**, 444
- **Scaphoid bone**, BP102, T7.1, 442–443, 445–447, 457
  - articulation with, 429
- **Scaphoid fossa**, BP29, 106
- **Scapholunate ligament**, 445
- **Scaphotrapeziotrapezoid ligament**, 444
- **Scapula**, BP4, 186, 197, 217, 245–247, 409, 416–417
  - acromial angle of, 409–410
  - acromion of, 192
  - anastomoses around, 418
  - anterior view of, 409
  - body of, 416
  - coracoid process of, 192, 217, 409–411
  - glenoid cavity of, 192, 409, 411–412
  - inferior angle of, 161, 248, 409–410
  - infraglenoid tubercle, 409–410
  - infraspinous fossa of, 192
  - lateral border of, 409–411
  - medial border of, 161, 409–410
  - neck of, 192, 409–410
  - posterior view of, 410
  - spine of, 161, 180, 183, 192, 203, 217, 410, 413, 415–418, 470
  - subscapular fossa of, 192
  - superior angle of, 409–410
  - superior border of, 409–410, 415
- **Scapula** *(Continued)*
  - suprascapular notch of, 192
  - supraspinous fossa of, 192
- **Scapular artery**
  - circumflex, BP23, BP100, T7.2, 417–419, 421, 424
  - dorsal, BP23, T7.2, 39–40, 179, 418–419
- **Scapular ligament, transverse**, 412
  - inferior, BP23
  - superior, BP23, 414–415, 417–418
- **Scapular nerve**, 419
  - dorsal, 420, 468
  - lower, 419
- **Scapular notch, superior**, 409–410, 417
- **Scapular region**, 3
- **Scapulohumeral dissection**, 417
- **Scapulothoracic dissection**, 417
- **Scarpa's fascia**, BP88, 324, 362. *See also* Membranous (Scarpa's) fascia
- **Scarpa's layer**, 359
  - of superficial fascia, 362–363
- **Schwalbe's line**, 101
- **Sciatic bursa**
  - of gluteus maximus muscle, 494
  - of obturator internus muscle, 494
- **Sciatic foramen**
  - greater, 167, 337–339, 531
  - lesser, 167, 337–338
- **Sciatic nerve**, BP109, 169, 395, 401, 485, 487, 489, 492–494, 496, 531
  - left, 400
  - muscular branches of, 492
  - right, 400
  - tibial division of, 531
- **Sciatic notch**
  - greater, 250, 334, 476
  - lesser, 250, 334, 476
- **Sclera**, BP26, 94, 100–103
  - lamina cribrosa of, 100
- **Scleral spur**, 100–101
- **Scleral venous sinus**, 100–101, 103–104
- **Scrotal arteries, posterior**, BP98, 385, 387
- **Scrotal branches, posterior**, 395
- **Scrotal ligament**, 371
- **Scrotal nerves, posterior**, 392–393, 493
- **Scrotal veins, anterior**, 259
- **Scrotal vessels, anterior**, 385
- **Scrotum**, 333, 368–370
  - Dartos fascia of, BP88, 349, 362, 369, 372, 377, 387
  - septum of, 349, 369, 372, 377, 387
  - skin of, 369, 372
  - superficial fascia of, 253–254
- **Sebaceous glands**, 1–2, 94
- **Secondary oocyte**, BP91
- **Secondary spermatocytes**, BP93, BP91
- **Segmental medullary arteries**, T3.1, 176–178
- **Sella turcica**, BP34, 14–15, 18, 45, 77
  - dorsum sellae of, 18
  - hypophyseal fossa of, 18
  - hypophysis in, 43
  - posterior clinoid process of, 18
  - tuberculum sellae of, 18
- **Semicircular canal**
  - anterior, 64, 108–109
    - plane of, 110
  - lateral, 108–110
    - prominence of, BP27, 105
  - posterior, 108–109
    - plane of, 110
- **Semicircular duct**
  - anterior, 108–110
  - lateral, 108–110
    - ampulla of, 135
  - posterior, 108–110
    - ampulla of, 135
  - superior, ampulla of, 135
- **Semilunar folds**, 72, 283
- **Semilunar hiatus**, 51
  - of newborn, 52
- **Semimembranosus bursa**, 497, 502
- **Semimembranosus muscle**, T8.1, T8.5, 395, 481, 484–485, 492, 496–497, 501, 506–507, 531
  - bursa of, 501
- **Semimembranosus tendon**, 497, 499, 501–502, 508–509
  - groove for, 504
- **Seminal colliculus**, BP97, 352, 366
- **Seminal vesicles**, BP93, 256, 348–349, 366, 371, 373, 385
- **Seminiferous epithelium**, BP93
- **Seminiferous tubules, convoluted**, BP93, 372
- **Semispinalis capitis muscle**, 180–182, 184
- **Semispinalis cervicis muscle**, 182, 184
- **Semispinalis muscle**, T3.3
- **Semispinalis thoracis muscle**, 182
- **Semitendinosus muscle**, T8.1, 85–86, 395, 471, 480–481, 485, 492–494, 496–498, 501, 507, 531
  - tendon of, 497
- **Semitendinosus tendon**, 482–483
- **Sensory cortex**, 146
- **Sensory nerves**, BP1
- **Septal papillary muscle**, 224
- **Septate hymen**, BP96
- **Septomarginal fasciculus**, BP43
- **Septomarginal trabecula**, 224, 228–229
- **Septum**, 372
  - bulging, 43
  - nasal, 12, 23, 45
  - of scrotum, 387
- **Septum pellucidum**, 117, 121–122, 152, 154, 156, 158
  - posterior veins of, 157
  - vein of, 156–157
- **Serosa (visceral peritoneum)**, BP62, 279, 289
- **Serous glands of von Ebner**, 71
- **Serratus anterior fascia**, 416
- **Serratus muscle**
  - anterior, T4.3, T7.5, BP46, 180, 186–188, 197, 221, 245–249, 252–253, 257, 260–261, 333, 402, 409, 413–414, 417, 419
    - digitations of, 194–195
  - posterior, T4.3
    - inferior, T3.3, T4.3, 180–181, 185, 257, 312
    - superior, T3.3, T4.3, 180–181
- **Sertoli cell**, BP93
- **Sesamoid bones**, BP4, 443, 446, 515–516, 525–528
  - foot, 519
- **Shoulder**
  - anteroposterior radiograph of, 411
  - arthrogram of, 470
  - computed tomography of, 470
  - glenohumeral joint of, 412
  - joint capsule of, 417
  - magnetic resonance imaging of, 470
  - muscles of, 413
  - nerves of, 468
- **Sibson's fascia**. *See* Suprapleural membrane (Sibson's fascia)
- **Sigmoid arteries**, 266, 293, 295, 305, 316, 380
- **Sigmoid colon**, BP65, 173, 270, 272, 283, 344, 346, 348, 356, 373–376, 392, 394
  - innervation to, 172
  - as site of referred visceral pain, BP13
- **Sigmoid mesocolon**, 272, 283, 294–295, 310, 316, 373
- **Sigmoid sinus**, 64, 76, 110, 114–115
  - groove for, 15, 18
  - imaging of, BP31, 159
  - in jugular foramen, 20

Sigmoid veins, 298–299, 381
Sinuatrial (SA) nodal artery, 229
Sinuatrial (SA) node, 41–42, 229
Sinuses. *See also specific sinuses*
  confluence of, 110, 114–115, 155–156
  prostatic, BP97
Sinusoids, 285–286
Skeletal system, T3.1, T6.1, T4.1, T5.1
  axial and appendicular, BP4
Skene's ducts, BP90. *See also* Paraurethral (Skene's) ducts
  openings of, 358
Skene's glands, 371. *See also* Paraurethral (Skene's) gland
  primordium of, 371
Skin, 33, 113
  cross section of, BP1
  radiology of, 165
  of scalp, 10, 31
Skin ligaments, BP1
Skull, BP4
  anterior view of, 11
  base of, 79
  lateral view of, 13
  midsagittal view of, 15
  of newborn, 21
  nuchal line of, superior, 181
  orientation of labyrinths in, 110
  radiographs of
    lateral view of, 14
    posterior view of, 12
    Waters' view of, 12
  reconstruction of, BP17
  superior nuchal line of, 182
Small intestine, BP9, 137, 270, 282, 324
  area for, 311
  arteries, 294
  autonomic innervation of, 304
  lymph vessels and nodes of, BP81
  mucosa and musculature of, 279
  as site of referred visceral pain, BP13
  veins of, 297
Small saphenous veins, BP107
Smooth muscle cell, BP16
Soft palate, 43, 45, 65, 72, 77, 79
  imaging of, 160
  muscles of, 78
Sole, muscle of
  second layer, 525–526
Soleus muscle, BP116, BP111, 85–86, 497, 506–514, 520, 522, 531–532
  arch of, 485
  into calcaneal tendon, 508
  nerve to, 507–508
  tendinous arch of, 508–509
Soleus tendon, BP116
Solitary lymphoid nodule, 279
Solitary tract, nuclei of, 127–128, 134, 136–137, 146, 231, 321
Somatic fibers, BP41
Space of Poirier, BP102
Space of Retzius, 350
Spermatic cord, 256, 263, 363–364, 400
  exiting, external spermatic fascia on, 262
  external spermatic fascia over, 387
  testicular vessels in, 383
Spermatic fascia
  external, BP59, 253–254, 260, 262, 349, 362–364, 369, 372
    spermatic cord and, 264, 387
    testis and, 387
  internal, BP59, 254, 369, 372
    origin of, 263
Spermatids, BP93, BP91
Spermatogenesis, BP93, BP91
Spermatogonium, BP93, BP91
Spermatozoa, BP93, BP91
Sphenoethmoidal recess, 43–44
Sphenoid bone, 11, 13, 15, 17–18, 22, 44–45, 49
  anterior clinoid process of, 15, 18
  body of, 15, 18, 45
    jugum of, 18
    prechiasmatic groove of, 18
    sella turcica of, 18
  carotid groove of, 18
  clivus of, 18
  crest of, 45
  foramen ovale of, 17
  foramen spinosum of, 17
  greater wing of, BP17, 11, 13–15, 17–18, 21
    groove for middle meningeal vessels, 18
  infratemporal crest of, 13
  lesser wing of, 11–12, 15, 18
  of newborn, 21, 52
  optic canal of, 15
  orbital surface of, 11
  pterygoid process of, 17, 23, 44
    hamulus of, 13, 15, 17, 23, 44
    lateral plate of, 13, 15, 17, 21, 23, 44–45
    medial plate of, 15, 17, 21, 23, 44–45
    pterygoid fossa of, 17
    scaphoid fossa of, 17
  sella turcica of, 15, 18
    dorsum sellae of, 18
    hypophyseal fossa of, 18
    posterior clinoid process of, 18
    tuberculum sellae of, 18
  sphenoidal sinus of, 15, 44–45
  spine of, 17, 23
Sphenoidal emissary foramen (of Vesalius), 20
Sphenoidal fontanelle, of newborn, 21
Sphenoidal sinus, BP26, BP22, BP34, BP44, 14–15, 43, 45, 50–51, 64, 72, 77, 98, 115, 148
  imaging of, 160
  opening of, 43–44, 51
Sphenomandibular ligament, 25, 56–58, 60
Sphenooccipital synchondrosis, 77
Sphenopalatine artery, 47, 57, 63, 83
  posterior lateral nasal branches of, 47, 63
  posterior septal branches of, 47, 57
Sphenopalatine foramen, 13, 15, 23, 44, 47–48, 57
Sphenopalatine vessels, in incisive fossa, 19
Sphenoparietal sinus, 114–115
Spherical recess, 108
Sphincter muscle
  external
    deep part of, 375
    subcutaneous part of, 375
    superficial part of, 375
  internal, 375
Sphincter pupillae muscle, T2.1, T2.8, 101, 132, 143
Sphincter urethrae, BP97, 345, 350, 359, 378
  muscle, BP90, T6.4, 339, 343, 351–352, 360
Sphincter urethrovaginalis muscles, T6.4, 350, 353, 359–361
Sphincters, female, 351
Spinal artery
  anterior, 149–150, 152, 154, 176–177
    anastomotic loops to, 176
  posterior, 150, 152, 176–177
    anastomotic loops of, 176
    left, 154, 177
    right, 177
  segmental medullary branches of, 149
Spinal branch, 177
Spinal canal, 326
Spinal cord, BP38, 6, 62, 169, 245–246
  anterior rami and, 169
  arteries of
    intrinsic distribution of, 177
    schema of, 176
  central canal of, 120, 125
  cross sections, BP43
    fiber tracts, BP43
  descending tracts in, 214
  gray matter of, 174
  imaging of, 160
  lateral horn of, 174
  lumbar part of, 399
    upper, BP41
  pia mater overlying, 174
  principal fiber tracts of, BP43
  sacral part of, BP41, 399
  sections through, BP43
  segments, 321
  sulcal (central) branches to, 177
  termination of, 170
  thoracic part of, BP41, 143–145, 214
  thoracolumbar, 306
  veins of, 178
  white matter of, 174
Spinal dura mater, 169, 185
  termination of, 170
Spinal ganglion, 399
  posterior root of, 174, 177, 186
Spinal meninges, T3.1
  nerve roots and, 174
Spinal nerve, 174, 177, 186, 232
  anterior ramus of, 174, 261
  anterior root of, 174, 303
  C8, 169
  dorsal ramus of, 177
    lateral branch of, 177
    medial branch of, 177
  L5, posterior ramus of, 167
  meningeal branch of, 177
  origin of, 175
    cross section of, 175
  posterior ramus of, 174
  T1, 169
Spinal nerve roots
  anterior root of, 174
  posterior root of, 174
  S1, 170
  S2, 170
  S3, 170
  S4, 170
  S5, 170
  vertebrae relation to, 170
Spinal nerve trunk, 261, 276
Spinal nucleus, 133
Spinal sensory (posterior root) ganglion, 303, 306, 309–310, 321
Spinal tract, 133, 137
Spinal vein
  anterior, 155, 178
  posterior, 155, 178
Spinalis cervicis muscle, 181
Spinalis muscle, 181
Spinalis thoracis muscle, 181
Spinocerebellar tract
  anterior, BP43
  posterior, BP43
Spinohypothalamic fibers, BP43
Spinomesencephalic fibers, BP43
Spinoolivary tract, BP43
Spinoreticular fibers, BP43
Spinothalamic fibers, BP43
Spinous process, BP38, BP18, 163–164, 167–168
  of C2, BP34
  of C7, BP35, T3.1, BP34, 181–182
  cervical, 27, 29

Spinous process *(Continued)*
  of L1, 165, 185
  of L2, radiology of, 165
  of L3, BP37, 164
  of L4, BP37
  lumbar, 163
  of T12, 161, 180–181, 183
  thoracic, 163
Spinous processes, T3.1
Spiral ganglion. *See* Cochlear (spiral) ganglion
Spiral ganglion of Corti, 109
Spiral lamina
  hamulus of, 108
  osseous, 108–109
Spiral ligament, 109
Splanchnic nerves, 305, 396
  greater, 172, 391, 396
    thoracic, 300–301, 303–304, 309–310, 320, 322
  least, 172, 391, 396
  lesser, 172, 391, 396
    thoracic, 300–301, 303–304, 320–322
  lumbar, 172, 306, 320, 322, 391–392, 394, 396–397, 399
    fifth, 392
    first, 321–322
    upper, 398
  pelvic, 173, 305–306, 321, 392, 394, 396–399, 489
  sacral, 172, 306, 320, 392, 394, 399, 489
  sympathetic, T5.2
  thoracic, 392
    greater, 397–398
    least, 398
    lesser, 397–398
Spleen, BP38, BP87, BP56, T5.2, BP84, BP57, 202–203, 217, 273–274, 285, 289, 323, 326–327, 330
  anterior extremity of, 289
  area for, 311
  inferior border of, 289
  posterior extremity of, 289
  as site of referred visceral pain, BP13
  in situ, 289
  superior borders of, 289
Splenic artery, 217, 289–291, 293–294, 300–301, 303, 309–310, 329
  splenic branches of, 290
Splenic flexure, of colon, 282
Splenic notch, 290
Splenic plexus, 301
Splenic red pulp, 289
Splenic trabeculae, 289
Splenic vein, 217, 241, 274, 294, 296–299, 323–324, 326
Splenic white pulp, 289
Splenius capitis muscle, T3.3, 36, 180, 184
Splenius cervicis muscle, T3.3, 180–181, 184
Splenorenal ligament, 273, 289
Spongy urethra, BP89
  bulbous portion of, 352, 367
  pendulous portion of, 367
Squamous suture, BP17, 21
Stapedius muscle, T2.8, 107
  nerve to, 134
  tendon of, BP27
  and tendon of, 106
Stapes, 106–107
  footplate of, 106
  limbs of, 27–28, 105
Stellate ganglion, 213, 230–231, 243. *See also* Cervicothoracic (stellate) ganglion
Sternal angle (of Louis), T4.1
Sternal head, of sternocleidomastoid muscle, 8
Sternalis muscle, 194
Sternoclavicular joint, 202, 245, 408
Sternoclavicular ligament, anterior, 408
Sternocleidomastoid muscle, T2.1, BP47, T2.8, 32–33, 36, 38–39, 41, 53, 68, 86, 138, 140, 180, 184, 187, 194, 204, 408, 413–414, 419
  clavicular head of, 8, 32, 36, 187
  medial margin of, 87
  sternal head of, 8, 32, 36, 187
Sternocleidomastoid nodes, 85
Sternocleidomastoid region, 3
  anterior, 2
Sternocostal articulations
  anterior view of, 193
  left anterolateral view of, 193
  right posterolateral view of, 193
Sternocostal head. *See* Pectoralis major muscle
Sternocostal joint, 408
Sternocostal triangle, 196
Sternohyoid muscle, T2.8, 32–33, 35–36, 38, 69, 139, 194, 196, 204, 408
Sternothyroid muscle, T2.8, 32–33, 35–36, 38, 92, 139–140, 194, 196, 204
Sternum, BP44, BP4, 186, 197, 200, 217, 220, 244, 413
  angle, 192
  body of, 187, 192, 194, 196, 198, 248–250
  jugular notch of, 192
  manubrium of, 31–34, 34–35, 36, 77, 196, 204
  xiphoid process of, 187, 192, 194
Stomach, BP87, BP56, T5.1, BP9, 173, 202, 221, 236, 240, 270, 274, 282, 284, 287, 289, 324, 326
  air within, 217
  arteries of, 290
  autonomic innervation of, 301–303
  body of, 276
  cardiac part of, 237, 239, 276
  fundus of, BP57, 237, 239, 276, 328
  greater curvature of, 276
  innervation to, 172
  longitudinal muscle layer of, 278
  lymph vessels and nodes of, BP79
  mucosa of, 277
  oblique muscle layer of, innermost, 239
  outer longitudinal muscle layer of, 239
  posterior surface of, 273
  pyloric part of, 276
  as site of referred visceral pain, BP13
  in situ, 276–283
  variations in position and contour of, BP60
  veins of, 296
Straight arteries, 279, 294–295
Straight gyrus, 118
Straight sinus, 110, 114–115, 117, 120, 155–157
  imaging of, BP31, 159
Straight veins, 297
Stratum basale, BP1
Stratum corneum, BP1
Stratum granulosum, BP1
Stratum lucidum, BP1
Stratum spinosum, BP1
Stretch receptors (Hering-Breuer reflex), 214
Stria medullaris, 125
  of thalamus, 117
Stria terminalis, 117, 122–123
Striate artery, long medial, 148, 150–153
Striated muscle, BP41
Stroma, BP97
Styloglossus muscle, T2.8, 49, 57, 68, 70, 78, 81, 139
Stylohyoid ligament, 22, 70, 72, 78, 81
Stylohyoid muscle, T2.8, 32, 35–36, 41, 49, 53, 57, 59, 68–70, 75, 81, 134
Styloid process, BP24, 13, 17, 21–23, 25, 36–37, 41, 49, 69–70, 75, 79, 81, 107
Stylomandibular ligament, 22, 25, 60
Stylomastoid artery, 76, 107
  posterior tympanic branch of, 107
  stapedial branch of, 107
Stylomastoid foramen, BP29, 17, 19, 134, 136
Stylopharyngeus muscle, T2.8, 68, 70, 72, 75–76, 78, 80–81, 136–137
Subacromial bursa, 412, 421
Subaponeurotic space, dorsal, 453
Subarachnoid space, 100, 111, 113, 120, 177
Subcallosal area, 117, 130
Subcallosal gyrus, 117
Subcapsular lymphatic plexus, 319
Subchondral bone, BP114, BP5
Subclavian artery, BP23, 4, 37, 39–40, 76, 82–84, 87, 89, 141, 147, 149, 176, 189, 195–196, 204, 215–216, 236, 240, 258, 266, 417–419
  grooves for, BP46
  left, 88, 179, 210, 217–218, 235, 245
  lung groove for, 205
  right, BP23, 88, 137, 179, 210, 234
Subclavian lymph nodes, 190–191
Subclavian lymphatic trunk, 212
Subclavian node, 85
Subclavian region, 2
Subclavian trunk, 85
  right, 268
Subclavian vein, T2.2, 5, 37, 39–40, 84, 87, 195–196, 204, 212, 215–216, 236, 241, 259, 417, 419
  grooves for, BP46
  left, 88, 179, 210, 235
  right, 88, 179, 210, 234
Subclavius fascia, 416
Subclavius muscle, T7.5, T2.8, BP46, 188, 195, 221, 234–235, 408, 414, 416, 419
  fascia investing, 416
  groove for, 408
Subcostal muscles, T4.3, 261
Subcostal nerve, T5.2, 169, 269, 311–312, 391, 396, 486–488
  anterior branch of, 487
  cutaneous branch of
    anterior, 260
    lateral, 257, 269, 473
  lateral branch of, 487
Subcostal plane, 251
Subcostal vein, 267
Subcutaneous artery, BP1
Subcutaneous bursa, 520
  lateral malleolus of, 520
Subcutaneous fat, radiology of, 165
Subcutaneous olecranon bursa, 428
Subcutaneous space, dorsal, 453
Subcutaneous vein, BP1
Subdeltoid bursa, 412
Subdiaphragmatic lymph nodes, pathway to, 190
Subhiatal fat ring, 239
Sublime tubercle, 426
Sublingual artery, 53, 70
Sublingual fossa, 24
Sublingual gland, BP22, BP40, 50, 53, 59, 65, 69, 134, 144, 172
  innervation to, 173
Sublingual nerve, 59
Sublingual vein, 53, 70
Sublobular veins, 285–286
Submandibular duct (of Wharton), 53, 65, 68–70
Submandibular fossa, 24
Submandibular ganglion, BP40, 53, 59, 70, 82, 133–134, 142, 144, 173
  schema of, 144
Submandibular glands, BP40, 8, 32, 34, 36, 38, 53, 59, 69, 79, 83–84, 134, 144, 172
  innervation to, 173

Submandibular node, 85–86
Submental artery, 57, 83
Submental node, 85–86
Submental vein, 38, 84
Submucosa
  esophageal, 239
  of ileum, 279
  of intestine, 308
  of jejunum, 279
Submucosal glands, 308
Submucosal (Meissner's) plexus, 308
Submucous space, 374–375, 378
Suboccipital nerve, 29, 184
Suboccipital triangle, 184
Subparotid node, 85
Subperiosteal circumferential lamellae, BP7
Subpleural capillaries, BP49
Subpleural lymphatic plexus, 212
Subpopliteal recess, 498–499
Subpubic angle, radiograph of, 335
Subscapular artery, BP23, BP100, 417–419, 424
Subscapular fossa, 409
  of scapula, 192
Subscapular lymph nodes, 190–191
Subscapular nerve
  lower, 414, 417, 420, 468
  upper, 414, 419–420
Subscapularis muscle, BP56, T7.6, 186, 197, 245–247, 409, 412, 414–417, 421, 423
Subscapularis tendon, 412, 415, 417
Subserous fascia, 394
Subserous neural plexus, 308
Substantia nigra, 118, 128
Subsynovial arteries. *See* Retinacular arteries
Subtendinous bursa, 502, 520
  of subscapularis muscle, 412
Subungual space, 460–461
Sulcal artery
  central, 153
  precentral, 153
  prefrontal, 153
Sulcal central vein
  anterior, 178
  posterior, 178
Sulcus
  calcarine, 116–118, 122, 131
  central
    of insula, 116
    of Rolando, 116–117
  cingulate, 117
  collateral, 117–118
  of corpus callosum, 117
  frontal
    inferior, 116
    superior, 116
  hippocampal, 123
  hypothalamic, 117, 125, 158
  intertubercular, 409
  lateral (of Sylvius), 116, 118
    anterior ramus of, 116
    ascending ramus of, 116
    posterior ramus of, 116
  lunate, 116
  marginal, 117
  median, 71, 125
  nasolabial, 8
  occipital, transverse, 116
  occipitotemporal, 117–118
  olfactory, 118
  orbital, 118
  paracentral, 117
  parietooccipital, 116–117
  postcentral, 116
  rhinal, 117–118
Sulcus *(Continued)*
  temporal
    inferior, 116, 118
    superior, 116
  terminal, 71
Sulcus limitans, 125
Sulcus terminalis, 218
Superciliary arch, 8
Superficial capsular tissue, BP102
Superficial circumflex iliac vein, BP107, 249
Superficial epigastric veins, BP107, 249
Superficial fascia, BP88, BP1, 33, 255, 349, 359
  deep membranous layer of, 363
  deeper membranous layer of, 362
  fatty layer of, 324
  membranous layer of, 324
  penile, BP88
  of penis, 252–253
  of scalp, 10
  superficial fatty (Camper's) layer of, 359, 362
Superficial fibers. *See* Tibial collateral ligament
Superficial fibular nerve, BP111, 514
Superficial inguinal nodes, T8.2
Superficial temporal artery, 49, 57
Superficial vein, T8.2
  of forearm, 406
  lateral, of penis, 363
  of neck, 38
Superficialis flexor tendons, 453
Superior, as term of relationship, 1
Superior articular facet, of L5, BP36
Superior articular process, 164, 167
  facets of, 166
  of L1, BP37
  of L2, 165
  of L4, BP37
Superior bulb, in jugular fossa, 19
Superior cervical ganglion, BP39
Superior cervical sympathetic cardiac nerve, 142
Superior cluneal nerves, 257
Superior costal facet, 163
Superior costotransverse ligament, BP33
Superior fascia, of pelvic diaphragm, 350, 359
Superior gemellus muscle, T8.6, 481, 485
Superior hypogastric plexus, BP39
Superior laryngeal vein, 80
Superior mediastinum, BP3
Superior mesenteric artery, 276
Superior mesenteric ganglion, BP41, BP39, 173
Superior mesenteric plexus, 39–40
Superior oblique muscle, 132
Superior petrosal sinus, 64
Superior pubic ramus, 250
Superior rectus muscle, 132
Superior suprarenal artery, left, 201
Superior vena cava vein, 5
Superior vertebral notch, 163
  of L3 vertebra, BP37
Superolateral nodes, 389
Superomedial nodes, 389
Supinator muscle, T7.6, 409, 430, 435, 437–441, 463, 469
Supraclavicular nerves, 9, 38–40, 140, 404–405
  intermediate, 404–405
  lateral, 404–405
  medial, 404–405
Supraclavicular nodes, 85
Supracondylar ridge
  lateral, 409–410, 426
  medial, 409–410, 426
Supradiaphragmatic fascia, 239
Supraduodenal artery, 290–291, 293–294
Supraglenoid tubercle, 409
Suprahyoid artery, 70, 83
Suprahyoid node, 85
Supralevator space, 374
Supramarginal gyrus, 116
Supramastoid crest, 13
Supraoptic recess, 117
Supraopticohypophyseal tract, 158
Supraorbital artery, 10, 42, 57, 94, 99, 149
Supraorbital margin, BP17, 12
Supraorbital nerve, 9, 42, 61, 94, 133
  lateral branch of, 97–98
  left, 98
  medial branch of, 97–98
Supraorbital notch, 8, 11, 13
  of newborn, 21
Supraorbital vein, 10, 84, 99
Suprapatellar bursa, 498, 502
Suprapatellar synovial bursa, 499
Suprapineal recess, 117
Suprapleural membrane (Sibson's fascia), 234
Suprarenal arteries
  inferior, 266, 323
  middle, 266, 313, 323
  superior, 266, 313, 323
Suprarenal glands, BP41, BP10, 278, 284, 288, 311–324, 368
  arteries of, 323
  autonomic nerves of, 322
  cross section, 323
  innervation to, 172
  left, 203, 273, 311, 330
  right, BP56, 203, 275, 311, 322
  veins of, 323
Suprarenal impression, 284
Suprarenal plexus
  left, 305
  right, 300
Suprarenal vein, 323
  left, 241
    inferior, 267, 313
  right inferior, 267
Suprascapular artery, BP23, T7.2, 39–40, 87–89, 149, 417–419
  infraspinous branch of, 418
Suprascapular foramen, 412, 415, 417–418
Suprascapular nerve, 417, 419–420, 468
Suprascapular notch, of scapula, 192
Suprascapular region, 3
Supraspinatus muscle, BP56, T7.6, 180, 183, 409–410, 412–418, 422, 468, 470
Supraspinatus tendon, T7.1, 412, 415, 417, 422, 470
Supraspinous fossa, 410
  of scapula, 192
Supraspinous ligament, 29, 167–168, 185, 337–338
  radiology of, 165
Suprasternal space (of Burns), 32–34, 77
Supratonsillar fossa, 72
Supratrochlear artery, 10, 42, 57, 94, 99, 149
Supratrochlear nerve, 9, 42, 61, 94, 97–98, 133
Supratrochlear node, 407
Supratrochlear vein, 10, 84
Supraventricular crest, 224, 228
Supravesical fossa, 256
Sural branches, 509
Sural nerve, BP111, T8.2, 115–116, 474, 531–533
  calcaneal branches of, lateral, 474
  lateral calcaneal branch of, 509
Surface anatomy
  of female, 2
  of male, 3
Suspensory (diaphragmatic) ligament, 368
  of axilla, 416
  of clitoris, 359, 361
  of ovary, 345–346, 355–357, 371, 382
  of penis, 253, 349
Suspensory retinacula, of breast, 188

- **Sustentaculum tali**, BP116, 516–517
- **Sutural (wormian) bone**, 13, 16
- **Sweat glands**, BP41, BP1
  - innervation to, 172
  - in perianal skin, 375
  - pore of, BP1
- **Sympathetic fibers**, 309
  - of autonomic reflex pathways, 307
  - of kidneys and upper ureters, 321
  - of lower ureter, 399
  - postganglionic, 232
  - postsynaptic, BP41
  - presynaptic, BP41
  - of renal artery, T5.2
  - in reproductive organs, 397
    - male, 398
  - of tracheobronchial tree, 214
  - of urinary bladder, 399
- **Sympathetic ganglion**, 177, 186, 197, 391–392, 396–398
  - sacral
    - left, 394
    - right, 394
  - thoracic, fourth, 231
- **Sympathetic nerves**, BP16, 214
- **Sympathetic nervous system**, BP39
  - general topography, BP39
  - schema of, 172
- **Sympathetic plexus**, 64
- **Sympathetic trunks**, 33, 49, 62, 76, 83, 136, 142, 144–145, 197, 201, 213–214, 234–235, 243, 261, 265, 269, 299–300, 309, 320, 322, 344, 348, 391–392, 394, 396–399, 488–489
  - cervical, 243
  - ganglia of, 320
  - left, 200, 220, 310, 322
  - right, 200, 310, 322, 394
  - sacral, 399
    - left, 394
    - right, 394
- **Symphyseal surface**, 338, 476
- **Synapses**, BP11
- **Synaptic cleft**, BP11
- **Synaptic endings, schematic of**, BP11
- **Synaptic vesicles**, BP11
- **Synchondrosis, of 1st rib**, 408
- **Synovial bursa**. *See* Suprapatellar bursa
- **Synovial cavities**, BP33, 30
- **Synovial joints**, BP114, BP5
- **Synovial membrane**, BP6, 412, 428, 460–461, 498–499, 502
  - attachment of, 499
  - protrusion of, 477
- **Synovium**, BP114, BP5
  - covering femur, BP114
  - cut edge of, BP114

T

- **Taenia**
  - fibers of, 376
  - free, 373, 376
- **Talar articular surface**, 517
- **Talocalcaneal ligament**, 517
  - lateral, 518
  - medial, 518
  - posterior, BP116, 517–518
- **Talofibular ligament**
  - anterior, BP116, 505, 518
  - posterior, 505, 517–518
- **Talonavicular ligament, dorsal**, 518
- **Talus bone**, BP116, 515–517, 535
  - posterior process of, 518
- **Tarsal artery**
  - lateral, 503, 512, 521, 527
  - medial, BP115, 503, 512, 521–522, 527
- **Tarsal bones**, BP4
- **Tarsal glands**, 94
  - openings of, 94
- **Tarsal (Müller's) muscle, superior**, T2.1, 94
- **Tarsometatarsal joint**, 515
- **Tarsometatarsal ligaments**
  - dorsal, 518, 527
  - plantar, 519
- **Tarsus**
  - inferior, 94
  - superior, 94, 96
- **Taste buds**, 71
- **Taste pathways, schema of**, 146
- **Tectal plate**, 117, 125
- **Tectorial membrane**, BP19, 30, 109
  - deeper (accessory) part of, 30
- **Tectospinal tract**, BP43, 143
- **Tectum, imaging of**, 160
- **Teeth**, BP9, 73–74
  - apical foramina of, 74
  - bone around, 74
  - canine, 73–74
  - cement of, 74
  - crown of, 74
  - dental pulp of, 74
  - dentinal tubules of, 74
  - dentine of, 74
  - enamel of, 74
  - incisor, 73–74
  - interglobular spaces of, 74
  - interproximal spaces of, 74
  - molar, 73–74
  - neck of, 74
  - odontoblast layer of, 74
  - permanent, 73–74
  - premolar, 73–74
  - root of, 51, 74
- **Tegmen tympani**, BP28, 105–106
- **Temporal artery**
  - anterior, 153
  - deep, 58, 83, 111
    - anterior, 57, 60
    - posterior, 13, 57, 60
  - middle, 10, 111, 153
  - polar, 153
  - posterior, 153
  - superficial, 41–42, 53, 57–58, 60, 63, 76, 82–84, 107, 111–112, 145, 147, 149
    - frontal and parietal branches of, 111
    - frontal branch of, 10, 99
    - parietal branch of, 10
- **Temporal bone**, BP17, 11, 13, 15, 17–18, 22
  - acoustic meatus of
    - external, BP17, 13, 17
    - internal, 15
  - articular tubercle of, 13, 17
  - asterion of, 13
  - carotid canal of, 17
  - cochlear window of, 21
  - external occipital protuberance of, 13
  - inferior tympanic canaliculus of, 17
  - jugular fossa of, 17
  - lambdoid suture of, 13
  - mandibular fossa of, 13, 17, 21
  - mastoid canaliculus of, 17
  - mastoid foramen of, 17
  - mastoid notch of, 17
  - mastoid process of, 13, 17
  - of newborn, 21
  - occipital artery of, groove for, 17
  - oval window of, 21
  - petrosquamous fissure of, 21
  - petrotympanic fissure of, 17
  - petrous part of, BP29, 12, 15, 17–18, 21, 110
    - arcuate eminence of, 18
    - greater petrosal nerve of, groove for, 18
    - internal carotid artery in, 148
- **Temporal bone** *(Continued)*
    - lesser petrosal nerve of, groove for, 18
    - sigmoid sinus of, groove for, 18
    - superior petrosal sinus of, groove for, 18
    - trigeminal impression of, 18
  - posterior deep temporal artery of, groove for, 13
  - sigmoid sinus of, groove for, 15
  - squamous part of, 13, 15, 18, 21
  - styloid process of, 13, 17, 21
  - stylomastoid foramen of, 17
  - superior petrosal sinus of, groove for, 15
  - supramastoid crest of, 13
  - tympanic part of, 21
  - vestibular aqueduct of, opening of, 15
  - zygomatic process of, 13, 17, 21, 58
- **Temporal fascia**, 31, 34, 55, 59
  - deep layer of, 55
  - superficial layer of, 55
- **Temporal fossa**, 13, 22
- **Temporal gyrus**
  - inferior, 116, 118
  - middle, 116
  - superior, 116
- **Temporal line**
  - inferior, 13
  - superior, 13
- **Temporal lobe**, 50, 124, 152
  - imaging of, 160
    - medial, BP32
- **Temporal nerve, deep**, 82, 133
  - anterior, 57, 59–60
  - posterior, 57, 59–60
- **Temporal pole, of cerebrum**, 116, 118
- **Temporal region**, 3
  - anterior, 2
- **Temporal retinal arteriole**
  - inferior, 103
  - superior, 103
- **Temporal retinal venule**
  - inferior, 103
  - superior, 103
- **Temporal sulcus**
  - inferior, 116, 118
  - superior, 116
- **Temporal vein**
  - deep, 111
  - middle, 10, 111
  - superficial, 53, 60, 84, 111
    - frontal and parietal tributaries of, 111
    - frontal branch of, 10
    - parietal branch of, 10
    - tributary of, 113
- **Temporalis muscle**, T2.9, 34, 50, 55, 59–60, 111, 113
- **Temporalis tendon**, 53
- **Temporofacial division**, 54
- **Temporomandibular joint**, T2.1, 25, 56
  - articular disc of, 55–56
  - capsule of, 58, 60
  - joint capsule of, 24–25
- **Temporomandibular ligament, lateral**, 25
- **Tendinous arch**, 81
  - of levator ani muscle, 339, 342–343, 347, 350, 352–353, 360, 374
  - of pelvic fascia, 347, 352
- **Tendinous intersection**, 187, 249, 253–254, 333
- **Tendocalcaneus bursa**, 510
- **Tendon sheath**, 452
  - of ankle, 520
  - of finger, 450–451, 453
  - of hand, 453
- **Tendons**, BP8
  - of ankle, 518
  - of foot, 519
- **Tenon's capsule**, BP26, 100

Tensor fasciae latae muscle, BP109, 85–86, 400–401, 471, 481–482, 484, 490–493, 496
Tensor tympani muscle, T2.9, BP27, 59, 106–107
  nerve to, 133
Tensor tympani tendon, 107
Tensor veli palatini muscle, T2.9, 56, 59, 67, 72, 78, 81, 106
  nerves to, 60, 133
  tendon of, 67, 78
Tensor veli palatini tendon, 67, 72
Tentorial artery, 115
Tentorium cerebelli, 97, 114–115, 155–156
Teres major muscle, T7.6, BP100, 161, 180, 183, 186, 246–247, 409–410, 413–414, 416–419, 421–423, 425, 468
Teres major tendon, 422
Teres minor muscle, T7.6, 180, 183, 197, 245–246, 410, 413–418, 422, 468
Teres minor tendon, 412, 415, 422
Terminal bronchiole, BP49
Testicle, 369
Testicular artery, BP98, BP109, 266, 300, 311, 313, 369, 385, 391, 398
Testicular plexus, 391, 398
Testicular vein, 256, 262, 264, 298, 311, 313, 316
  covered by peritoneum, 263
Testicular vessels, 348, 383, 390
  in spermatic cord, 383
Testis, BP93, BP10, 324, 349, 368–369, 371–372, 390, 398
  appendix of, 371
  arteries of, 383
  descent of, 368
  external spermatic fascia over, 387
  lobules of, 372
  mediastinum of, 369, 372
  rete, 372
  tunica albuginea of, 369
  tunica vaginalis, 369
    parietal layer of, 372
    visceral layer of, 372
  veins of, 383
Thalamic veins, superior, 157
Thalamogeniculate arteries, 154
Thalamoperforating arteries, 151, 154
Thalamostriate vein
  inferior, 155, 157
  superior, 117, 122, 156–157
Thalamotuberal artery, 151
Thalamus, 119, 121–125, 156, 158, 303
  geniculate bodies of, 154
  imaging of, 160
  left, 155
  pulvinar of, 150, 154, 156
  stria medullaris of, 117, 122
  ventral posteromedial nucleus of, 146
Theca externa, BP95
Theca interna, BP95
Thenar eminence, 402
Thenar muscles, 447, 449–450, 466
Thenar space, 450–451, 453
Thigh
  arteries of, BP108, 490, 492
  deep vein of, BP107
  fascia lata of, 353, 359, 362–363
  medial, 2
  muscle of, 482, 484–485
    bony attachments of, 480–481
  nerves of, 490, 492
  serial cross sections, 496
Thoracic aorta, 41–42, 177, 197, 200, 220, 235–236, 240
  descending, BP57, 244, 247–248
    lung groove for, 205
Thoracic aortic plexus, 213
Thoracic artery
  inferior, esophageal branch of, 240
  internal, BP23, 41–42, 88, 149, 189, 196–197, 204, 210, 215–216, 220, 236, 246–248, 258, 418
    anterior intercostal branches of, 195
    left, 199–200, 235
    medial mammary branches of, 189
    perforating branches of, 189, 194, 196, 417
    right, 199–200, 234
  lateral, BP100, 189, 194–195, 258, 417–419, 424
  superior, BP100, 195, 418–419, 424
Thoracic cage, BP4
Thoracic cardiac branches, 213, 231, 243
Thoracic cardiac nerves, 199
Thoracic cavity, BP3
Thoracic constriction, 237
Thoracic duct, BP56, BP84, T2.3, 7, 85, 195, 200, 204, 210, 212–213, 215, 220, 235–236, 241–242, 245–248, 268, 300, 324, 328
Thoracic ganglion
  first, 172
  fourth, 230
  second, 231
  section through, 177
  sixth, 213
  third, 230, 243
Thoracic intervertebral discs, T8-9, 200
Thoracic kyphosis, 162
Thoracic nerve, 417
  internal, 258
  lateral, 419
  long, T7.1, T4.1, 189, 194–195, 260, 417
  posterior ramus of, 197
  superior, 417
Thoracic region, lateral, 2
Thoracic spinal cord, 214
Thoracic spinal nerves
  T1, 143–145, 169
    dermatome of, 171
    vertebrae relation to, 170
  T2, 144–145
    dermatome of, 171
    vertebrae relation to, 170
  T3
    dermatome of, 171
    vertebrae relation to, 170
  T4
    dermatome of, 171
    vertebrae relation to, 170
  T5
    dermatome of, 171
    vertebrae relation to, 170
  T6
    dermatome of, 171
    vertebrae relation to, 170
  T7
    anterior ramus, 396
    dermatome of, 171
    dorsal rootlets of, 169
    vertebrae relation to, 170
  T8
    dermatome of, 171
    dorsal rootlets of, 169
    vertebrae relation to, 170
  T9
    dermatome of, 171
    vertebrae relation to, 170
  T10
    anterior ramus, 392
    dermatome of, 171
    vertebrae relation to, 170
  T11
    anterior ramus, 396
    dermatome of, 171
Thoracic spinal nerves *(Continued)*
  T12, 169
    dermatome of, 171
    dorsal rootlets of, 169
    vertebrae relation to, 170
  typical, 186
Thoracic splanchnic nerves, 232
  greater, 261, 269
  left greater, 305
  lesser, 261, 269
Thoracic sympathetic trunk ganglion, first, 143
Thoracic trunk ganglion
  lower, 232
  upper, 232
Thoracic vein
  internal, 88, 195–196, 198, 204, 216, 220, 246–248, 259
    left, 200
    perforating branches of, 196
    perforating tributaries to, 259
    right, 200
  lateral, 259
  perforating branch of, 197
Thoracic vertebrae, 162–163
  L1, body of, 167
  T1, 22, 29
    anterior view of, 162
    inferior articular facet for, 22
    lateral view of, 162
    posterior view of, 162
    spinal nerve relation to, 170
    spinous process of, 203
  T2, spinal nerve relation to, 170
  T3, spinal nerve relation to, 170
  T4, spinal nerve relation to, 170
  T5, spinal nerve relation to, 170
  T6
    lateral view of, 163
    spinal nerve relation to, 170
    superior view of, 163
  T7
    posterior view of, 163
    spinal nerve relation to, 170
  T8, 220
    posterior view of, 163
    spinal nerve relation to, 170
  T9, 165
    posterior view of, 163
    spinal nerve relation to, 170
  T10, spinal nerve relation to, 170
  T11, spinal nerve relation to, 170
  T12, 217
    lateral view of, 162–163
    posterior view of, 162
    spinal nerve relation to, 170
    spinous process of, 413
    vertebra, BP36
Thoracic visceral nerves, BP39
Thoracic wall
  anterior, 194–195
    internal view of, 196
  internal, veins of, 198
Thoracoabdominal nerves, 261
  anterior root of, 261
  collateral branch, 261
  communicating branch, 261
  cutaneous branch of, 194
    anterior, 261
    lateral, 261
  lateral branch of, 261
  medial branch of, 261
  meningeal branch of, 261
  posterior ramus of, 261
  posterior root of, 261

Thoracoacromial artery, BP100, 194–195, 416, 418–419, 424
  acromial branch of, 418–419, 424
  clavicular branch of, 418–419, 424
  deltoid branch of, 413, 418–419, 424
  pectoral branch of, 418–419, 424
Thoracoacromial vein, acromial branch of, 405
Thoracodorsal artery, BP23, BP100, 417–419, 424
Thoracodorsal nerve, 414, 417, 419–420
Thoracodorsal vein, BP99
Thoracoepigastric vein, 252, 259
Thoracolumbar fascia, 180, 182–183, 185, 257, 312
  anterior layer, 182, 185
  middle layer, 185
  posterior layer, 181, 185
Thoracolumbar spinal cord, 306
Thoracolumbar spine
  anteroposterior radiograph of, 165
  L3
    inferior end plate of, BP36
    superior end plate of, BP36
  lateral radiograph of, BP36
  radiographs of, BP36
Thorax, 187–248
  autonomic nerves in, 213
  bony framework of, 192
  coronal CTs in, BP57
  coronal section of heart and ascending aorta, BP56, 221
  cross section of
    at T3-4 disc level, 246
    at T3 level, 245–248
    at T4-5 disc level, 247
    at T7 level, 248
  nerves of, 230
  surface anatomy of, 187
Thumb, 447
Thymus, BP10, 7, 215, 234–235, 244, 246
  lung area for, 205
Thyroarytenoid muscle, T2.9, 91–92
  action of, 93
  thyroepiglottic part of, 91–92
Thyrocervical trunk, BP23, 39–41, 76, 82–83, 87–89, 147, 149, 236, 240, 418
  left, 179
  right, 179
Thyroepiglottic ligament, 90
Thyrohyoid membrane, 35, 75, 77–78, 80–81, 87, 89–90, 92
Thyrohyoid muscle, T2.9, 32, 35–36, 38, 69, 92, 139–140
  branch to, 41
  nerve to, 82, 140
Thyroid artery
  inferior, 22–23, 40–41, 76, 87–89, 147, 149, 230, 418
  superior, 38, 41, 76, 83, 87–89, 147, 149
    laryngeal branch of, 41
Thyroid articular surface, 91–92
Thyroid cartilage, T2.1, 8, 22, 32, 35, 38, 77–78, 80–81, 87, 92, 202, 208, 210, 237–238
  inferior horn of, 90
  lamina of, 90–91
    posterior border of, 75
  oblique line of, 35
  superior horn of, 75, 80–81, 90
Thyroid gland, T2.2, BP10, 33, 35, 38, 40, 76–77, 84, 89, 92, 202, 204, 210, 221
  anterior view of, 87
  fibrous capsule of, 89
  isthmus of, 87
  left lobe of, 87, 89
  posterior view, 88
Thyroid gland *(Continued)*
  pyramidal lobe of, 87
  right lobe of, 87–89
Thyroid ligament, posterior, 89
Thyroid nodes, superior, 85
Thyroid notch, superior, 90
Thyroid vein
  inferior, 38, 84, 87–89, 204, 215
  internal, 241
  middle, 38, 84, 87, 89
  superior, 38, 84, 87, 89, 92
Thyropharyngeus muscle, 80
Tibia, T8.1, BP113, BP116, BP111, BP4, 501–502, 504–505, 511–512, 514, 517–518, 520, 522, 535
  anterior border of, 471
  articulating surface of, BP114
  condyle of
    lateral, 484, 510
    medial, 498
  medial malleolus of, 520, 522
  superior articular surface of, 499
  synovium covering, BP114
Tibial artery, 514
  anterior, BP110, BP111, BP108, 4, 115–116, 503, 509, 512, 514, 521–522
  posterior, BP110, BP111, BP108, 4, 115–116, 503, 507–509, 513–514, 520, 524–525
    medial calcaneal branches of, 523
    medial malleolar branches of, 513
    posterior medial malleolar branch of, 509
  in tarsal tunnel posterior to medial malleolus, T8.2
Tibial collateral ligament, 483, 501, 512
Tibial nerve, BP111, 115–116, 485, 487, 489, 492, 507–509, 513–514, 531–532
  articular branch of, 531–532
  lateral calcaneal branch of, 532
  medial calcaneal branch of, 474, 523, 531–532
  posterior, 520, 525
Tibial plateau, 501
Tibial recurrent artery, posterior, BP108
Tibial tendon, posterior, BP116
Tibial tuberosity, 482–483, 497–500, 502, 505, 510–511
Tibial vein, 507, 514
  anterior, BP107, 5, 514
  posterior, BP111, 5, 507, 509, 513–514
    medial malleolar branches of, 513
Tibialis anterior muscle, BP116, BP111, 85–86, 471, 484, 497–498, 506, 510–512, 514, 522, 533
Tibialis anterior tendon, BP116, BP111, BP117, 511–512, 522, 527
  tendinous sheath of, 521
Tibialis posterior muscle, BP111, 85–86, 506, 509, 513–514, 532
Tibialis posterior tendon, BP116, 507–509, 513, 518, 525–527
Tibiofibular ligament
  anterior, 505, 518
  posterior, 517–518
Toe
  digital nerves of, dorsal, 473
  fifth, vein of, 473
  great, phalanx of, 519, 528
Toenail, anatomy of, BP117
Tongue, BP35, BP9, 45, 53, 68, 70–72
  apex of, 71
  body of, BP22, 50, 71, 77
  dorsum of, 71
  frenulum of, 53, 65
  imaging of, 160
Tongue *(Continued)*
  intrinsic muscles of, 71, 139
    inferior longitudinal, 139
    superior longitudinal, 139
    transverse and vertical, 139
  longitudinal lingual muscle of
    inferior, 68
    superior, 68
  lymph vessels and nodes of, 86
  lymphatic drainage of, 86
  root of, 71, 75, 77, 79–80, 91
  transverse muscle of, T2.9
  transversus linguae muscle of, 68
  vertical muscle of, T2.9
  verticalis linguae muscle of, 68
Tonsillar artery, 57, 83
Tonsillar branches, 57
Tonsils, 7, 125
Torus tubarius, 43, 45, 72, 79
Trabeculae, BP7, BP30
  artery of, BP30
Trabecular bone, BP7
Trabecular meshwork and spaces of iridocorneal angle (of Fontana), 101
Trachea, BP41, BP56, BP34, BP44, BP57, 22, 33, 35, 77–79, 81, 87–91, 137, 173, 202, 204, 208, 210–211, 215, 217, 221, 234, 236–238, 240, 245–246
  air within, BP36
  connective tissue sheath of, 208
  cross section through, 208
  elastic fibers of, 208
  epithelium of, 208
  gland of, 208
  innervation to, 172
  lung area for
    left, 205
    right, 205
  lymph vessels of, 208
  nerve of, 208
  small artery of, 208
Trachea air column, BP34
Tracheal bifurcation, 41–42
Tracheal cartilages, 208
Tracheal wall
  anterior, 208
  posterior, 208
    mucosa of, 208
Trachealis muscle, 208
Tracheobronchial lymph nodes, 268
  inferior, 212, 242, 247
  superior, 242, 246
    left, 212
    right, 212
Tracheobronchial tree, innervation of, schema of, 214
Tracheoesophageal groove, 81
Tract of Lissauer. *See* Dorsolateral fasciculus
Tragus, 8, 106
Transpyloric plane, 251
Transversalis fascia, BP59, 185, 254–256, 262–264, 266, 324, 344, 347–348, 350, 359
Transverse acetabular ligament, BP109
Transverse cervical nerves, 38
Transverse colon, 270, 274, 278, 283, 287–289, 295, 297, 330–331
Transverse costal facet, 163
Transverse fasciculi, 449, 523
Transverse fibers, BP6
Transverse foramen, 26
  bony spicule dividing, 27
  septated, 27
Transverse ligament, of atlas, 30
Transverse mesocolon, 270, 273–274, 278, 283, 297
  attachment of, 275

Transverse plane, 1
Transverse process, 163–164, 167–168, 185, 193
  of C6, BP34
  cervical, 26, 29
  of coccyx, 166
  lumbar, 163, 167, 334
    L1, 165
    L3, BP37
  thoracic, 163
Transverse ridges, 166
Transverse sinus, 110, 114–115, 156
  groove for, 15, 18
  imaging of, BP31, 159
  left, 155
Transverse vesical fold, 256
Transversospinal muscle, 245
Transversus abdominis muscle, BP47, BP85, T5.3, 181, 195–196, 254, 256, 258–259, 261–262, 265, 269, 283, 311–312, 344, 348, 486, 488
  aponeurosis of, 255, 258
  tendon of origin, 181, 185
Transversus abdominis tendon, 181
Transversus thoracis muscle, T4.3, 186, 195–197, 220
Trapeziocapitate ligament, 444–445
Trapeziotrapezoid ligament, 444–445
Trapezium bone, BP102, BP5, 442–448, 452, 457
Trapezius muscle, T3.3, T2.1, BP56, T3.1, T7.6, 8, 32–36, 38, 138, 194–195, 197, 245–248, 257, 402, 408–410, 413–414, 416, 419
  spine of, T3.2, 161, 180, 183–184, 186
Trapezoid bone, BP102, 442–443, 445–447, 452
Trapezoid ligament, 408, 412, 415
Triangle
  anal, 362
  of auscultation, 161, 257, 413
  cystohepatic (Calot's), 287
  deltopectoral, 413
  inguinal, T5.1, 256, 262
    transversalis fascia within, 262
  lumbar (of Petit), 161, 180, 257
  lumbocostal, 201
  sternocostal, 196
  suboccipital, 184
  urogenital, 362
Triangular aponeurosis, 454
Triangular fold, 72
Triangular fossa, 106
Triangular ligament
  left, 284
  right, 275, 283–284
Triangular space, 417
Triceps brachii muscle, T7.6, 161, 187, 402, 409–410, 413–414, 418–419, 422–423, 425, 427, 440, 468
  lateral head of, 161, 246–247, 402, 413
  long head of, 161, 245–247, 402, 410, 413
  tendon of, 161, 402
Triceps brachii tendon, 425, 428, 434–435, 468
Tricuspid valve. *See* Atrioventricular valve, right
Trigeminal cave, imaging of, 160
Trigeminal ganglion, 59, 61, 66, 97–98, 115, 128, 143–146
Trigeminal impression, 18
Trigeminal nerve (CN V), T2.2, 60–61, 64, 66, 110, 124, 128, 142, 144–146, 155, 171
  distribution of, 129
  ganglion of, 133, 142
  imaging of, 160
  mandibular division of, 9
  maxillary division of, 9
  mesencephalic nucleus of, 127–128, 146
  motor nucleus of, 127–128, 146
Trigeminal nerve (CN V) *(Continued)*
  motor root of, 142
  ophthalmic division of, 9
  principal sensory nucleus of, 127–128, 133
  schema of, 133
  sensory root of, 142
  spinal nucleus of, 137
Trigeminal tubercle, 125
Trigonal ring, 351
Triquetrocapitate ligament, 444
Triquetrohamate ligament, 444–445
Triquetrum bone, BP102, 442–443, 445–447
Triticeal cartilage, 90
Trochanter of femur
  greater, BP109, 161, 250, 334, 400–401, 477–478, 483, 485–486, 492–493, 534
    radiograph of, 335
  lesser, 250, 334, 477–478, 534
    radiograph of, 335
Trochanteric bursae
  of gluteus maximus muscle, 494
    inferior extension of, 494
  of gluteus medius muscle, 494
Trochanteric fossa, 479
Trochanteric region, 2
Trochlea, 96, 409, 426
Trochlear nerve (CN IV), BP26, T2.2, 60, 64, 96–98, 115, 124–125, 127–128, 155
  distribution of, 129
  schema of, 132
  in superior orbital fissure, 20
Trochlear notch, 426–427, 429
Trochlear nucleus, 127–128, 132
True ribs, 192
Tubal artery, 107
Tubal branches
  of ovarian vessels, 386
  of uterine artery, 386
Tuber cinereum, 117–118, 124
  median eminence of, 158
Tubercle
  anal, 370
  anterior, 122
  lateral part of, 370
Tuberohypophyseal tract, 158
Tuberosity, 517
  tibial, 504
Tufted cell, 130
Tunica albuginea, BP95, 363, 367, 372
  of testis, 369
Tunica vaginalis
  cavity of, 368
  testis, 324, 369, 372
    parietal layer of, 369
    visceral layer of, 369
Tympanic artery
  anterior, 57–58, 60, 107, 149
  inferior, 64, 107
  superior, 60
Tympanic canaliculus, inferior, 17, 19
Tympanic cavity, 27–28, 62, 105–107, 109, 135–136
  labyrinthine wall of, BP27
  lateral wall of, BP27
Tympanic cells, BP27
Tympanic membrane, 27–28, 59, 105–107, 109
Tympanic nerve, 64, 106, 134, 136, 145
  inferior, 107
Tympanic plexus, 107, 134, 136, 143, 145
  tubal branch of, 136
Tyson's gland, 364

U

Ulna, BP102, T7.1, 4–5, 426–433, 435, 439–445, 447, 455, 460
  anterior border of, 429
Ulna *(Continued)*
  anterior surface of, 429
  coronoid process of, 426
  interosseous border of, 429
  olecranon of, 402, 422, 426–427, 429, 431, 434–435, 468
  radial notch of, 426, 429
  styloid process of, 429, 447
  tuberosity of, 426
Ulnar artery, 4, 100–101, 423, 436–438, 441, 444, 449–450, 452, 456, 463
  deep branch of, 444
  deep palmar branch of, BP101, 424, 437, 444, 449–450, 455–456, 463
  dorsal carpal branch of, 459
  palmar carpal branch of, 438, 455
  pulses at, 4
Ulnar collateral artery
  inferior, 100–101, 423, 435
  superior, 100–101, 423, 425, 434–435
Ulnar collateral ligament, BP102, 428
Ulnar nerve, T7.1, 404, 419–420, 422–423, 425, 434–438, 441, 444, 450, 452, 455–456, 459, 462–467
  articular branch of, 467
  common palmar digital branch of, 463
  communicating branches of, 458
  deep branch of, 437–438, 449–450, 455–456, 463, 467
  dorsal branch of, 404, 406, 434, 437–438, 441, 458–459, 463, 467
  groove for, 410, 426
  palmar branch of, 404, 406, 437, 449, 462, 467
    digital, 404, 462–463
  superficial branch of, 437, 449–450, 456, 463, 467
Ulnar recurrent artery
  anterior, 100–101, 424, 437–438
  posterior, 100–101, 424, 434–435, 438
Ulnar styloid process, 442
Ulnar tuberosity, 421, 429
Ulnar vein, BP99, 5
Ulnocapitate ligament, 444
Ulnocarpal ligament
  dorsal, BP102
  palmar, BP102, 444
Ulnolunate ligament, 444
Ulnotriquetral ligament, 444–445
Umbilical artery, BP98, 233, 256, 317, 380, 382, 384–385
  fibrous part of, 344, 347–348, 384
  obliterated, 357
    left, 256
  occluded distal part of, 384
  patent part, 266
  right, BP98
Umbilical fold
  lateral, 344, 348
    right, 256
  medial, 344, 348, 356, 382
    right, 256
  median, 344, 348
Umbilical ligament
  medial, BP98, 233, 254–256, 262–264, 266, 316–317, 344, 347–348, 356, 382, 384
  median, BP98, 255–256, 264, 324, 344, 347–348, 350, 356, 382
Umbilical prevesical fascia, 256, 262, 347, 349
Umbilical region, 2, 251
Umbilical vein, T5.2, 233
Umbilicus, T5.1, 249, 256, 299, 333, 379
Umbo, 106, 109
Uncal vein, 156

Uncinate process, 43–44, 51
  cervical, 27
  left, area for articulation of, 27
  right, articular surface of, 27
Uncovertebral articulation, BP34
Uncovertebral joints, 28
Uncus, 28, 117–118, 130
Upper limb, BP4, 402–470
  arteries of, 463
  cutaneous innervation of, 404
  dermatomes, 403
  lymph vessels and nodes of, 407
  lymphatics of, 7
  nerves of, 463–464
    cutaneous, 405
  superficial veins of, 405
  surface anatomy of, 402
  veins of, BP99
Urachus, 344, 349, 359, 382
  median, BP98, 350
  remnant of, 356
Ureter, BP98, T6.1, BP85, 256, 264, 267, 272, 299, 311, 314, 316, 344–350, 353, 355, 366, 373–374, 382–386, 392, 394, 399
  in abdomen and pelvis, 316
  arteries of, 317
    left, 356
  autonomic nerves of, 320
  lower, innervation of, 399
  retroperitoneal space, 356
  right, 316, 357
  as site of referred visceral pain, BP13
Ureteric branch, middle, 320
Ureteric fold, 344, 346, 348
Ureteric orifice, BP90, 356, 366
  left, 352
  right, 352
Ureteric plexus, 392
Ureteropelvic junction, 331
Ureterovesical junction, pubocervical fascia, 354
Urethra, BP41, 89–90, 265, 339–341, 343, 345, 350–352, 354, 356, 360, 363, 365–367, 371, 401
  beginning of, 400
  cavernous venous plexus of, BP90
  female, BP90
    pelvis, 401
  floor of, 367
  hiatus of, 342
  membranous, BP93, BP89, 367
  musculofascial extensions to, 341
  penile, BP93
  prostatic, BP97, BP93, BP89, 367, 400
  pubocervical fascia, 354
  roof of, 367
  spongy, BP89
    bulbous portion of, 352, 367
    pendulous portion of, 367
Urethrae muscle
  compressor, T6.3, 353, 360–361, 386
  sphincter, T6.4, 360
Urethral artery, 365, 387
Urethral branches, BP98
Urethral crest, 366–367
Urethral glands, BP90
  of Littré, 367
Urethral lacunae, of Morgagni, 367
Urethral meatus, external, 349
Urethral orifice, external, BP90, 333, 345, 358, 361, 364, 367, 370, 377
Urethral raphe, 370
Urethral sphincter muscle
  external, BP88, BP98, 256, 349, 351, 365–367, 399
  internal, 351–352, 367
    loop of Heiss, 351
Urethral sphincter muscle *(Continued)*
    posterior loop, 351
    trigonal ring, 351
Urethrovaginalis sphincter muscle, T6.4, 339, 351, 353
Urinary bladder, BP41, 165, 173, 256, 263, 270, 282, 305, 311, 324, 344–350, 356, 365–366, 368, 373, 379, 382, 385, 394, 399
  apex of, 349–350
  autonomic nerves of, 320
  body of, 349–350
  female, 352
  fundus of, 349–350
  innervation of, 172, 399
  interior of, 400
  male, 352
  neck of, BP90, 349–350
  orientation and supports of, 350
  pulled up and back, 350
  trigone of, BP90, 349–350, 366–367
  ureteric orifice of, 350
Urinary fascia, 349
Urinary system, T6.1, T5.1
Urogenital diaphragm, 385
Urogenital fold, 370
Urogenital groove, 370
Urogenital hiatus, 351
Urogenital sinus, 371
Urogenital triangle, 362
Uterine artery, T6.2, 316–317, 356–357, 382, 384
  branches of, 386
  cardinal (Mackenrodt's) ligament with, 347
  vaginal branches of, 386
Uterine cavity, contrast within in, 357
Uterine cycle, BP92
Uterine development, BP94
Uterine fascia, 347
Uterine ostium, 355
Uterine veins, 267
  superior, 381
Uterine vessels, 346, 353, 386
  ovarian branches of, 357
Uterine (fallopian) tube, 344–346, 353–356, 371, 382, 394, 397
  ampulla, 357
  contrast within, 357
  fimbriae of, 357
  folds of, 355
  infundibulum of, 357
  left, 356
  right, 356
Uterosacral fold, 316, 344
  right, 356
Uterosacral ligament, 345, 347, 354–355
Uterovaginal fascia, BP88, 346, 353, 359
Uterovaginal plexus, 394, 396
Uterovaginal venous plexus, 267
Uterovesical pouch, 357. *See also* Vesicouterine (uterovesical) pouch
Uterus, BP88, T6.1, 353, 355, 359, 371, 373, 394, 397
  arteries of, 386
  body of, 345–346, 355
  cervix of, 345–347, 353, 355–356
  endometrium of, 379
  external os of, 357
  fundus of, 344–346, 350, 355, 379
  isthmus of, 355
  ligaments of
    fascial, 354
    round, BP90, 344–346, 352–354, 356, 359, 371, 382
  myometrium of, 379
  round ligament of, 267
Uterus *(Continued)*
  supporting structures, 353
  through overlying peritoneum, 356
  veins of, 386
Utricle, 108–109, 135
Uvula
  of bladder, 366–367
  of palate, 65, 72, 75, 79
  of vermis, 125

V

Vagal fibers, 137
Vagal trigone, 125
Vagal trunk, 265
  anterior, BP40, 137, 213, 236, 243, 300–301, 304–305, 309–310, 320, 322, 392
    gastric branches of, 137
    hepatic branch of, 137
  posterior, BP40, 243, 300–301, 304–305, 309–310, 320, 392
Vagina, BP90, T6.1, 339–341, 345, 350–353, 356, 359–360, 371, 373, 377, 379, 382, 397, 401
  horizontal portion of, 354
  musculofascial extensions to, 341
  pubocervical fascia, 354
  supporting structures, 353
  vertical portion of, 354
  vestibule of, 353, 358, 371
Vaginal arteries, 353, 357, 382, 384, 386
  inferior, 350
  internal, 347
  left, 356
Vaginal fascia, 373
Vaginal fornix, 345
  anterior, 345, 356
  posterior, 356
Vaginal orifice, BP90, 345, 358, 361, 370
Vaginal vein, 381
Vaginal wall, 353–354
Vaginorectal fascial fibers, 347
Vagus nerve (CN X), 33, 39–41, 40–41, 49, 64, 66, 76, 83, 87–89, 115, 124, 127–128, 136, 138, 141–142, 146, 173, 210, 213–215, 231, 236, 243, 306, 321
  auricular branch of, 9, 19, 137
    communication to, 136
  cervical cardiac branch of
    inferior, 137, 230
    superior, 137, 141–142, 230
  distribution of, 129
  dorsal nucleus of, 127, 137
  ganglion of
    inferior, 64, 76, 137–139, 146, 243
    superior, 76, 137–138
  in jugular foramen, 20
  in jugular fossa, 19
  laryngopharyngeal branch of, 141
  left, BP51, 88, 199, 210, 216, 230, 235, 245–246
  meningeal branch of, 137
  pharyngeal branch of, 76, 136–137, 141–142, 243
  posterior nucleus of, 128, 231, 306, 321
  recurrent laryngeal branch of, T4.1
  right, 88, 199, 210, 216, 230, 234, 243, 245
  schema of, 137
  superior ganglion of, 243
  thoracic cardiac branch of, 137, 230–231
Vallate papilla, 71, 146
Vallecula, 71–72
Valves of Houston, 375
Valves of Kerckring, 279, 287. *See also* Circular folds (valves of Kerckring)

Vas deferens, 348–349, 352, 366, 368, 371, 373, 385, 391–392, 398. *See also* Ductus (vas) deferens
  ampulla of, 366
  arteries to, 380, 383, 385
Vasa vasorum, BP16
Vascular smooth muscle, innervation to, 172
Vastoadductor intermuscular septum, 482, 491
  cover femoral vessels to popliteal fossa, 490
Vastus intermedius muscle, 85–86, 480–483, 498, 529. *See also* Quadriceps femoris muscle
Vastus intermedius tendon, 491
Vastus lateralis muscle, 85–86, 401, 471, 480–484, 490–491, 496–498, 510–511, 529. *See also* Quadriceps femoris muscle
  deep to iliotibial tract, 492
Vastus medialis muscle, 85–86, 471, 480–483, 490–491, 496–498, 511, 529. *See also* Quadriceps femoris muscle
  nerve to, 490
Veins. *See also* specific veins
  of abdominal wall
    anterior, 259
    posterior, 267
  of anal canal, 381
  of duodenum, 296
  of esophagus, 241
  of eyelids, 99
  of face, 10
  of forearm, 406
  of hypothalamus and hypophysis, BP30
  of iris, 104
  of large intestine, 298
  of leg, T8.2
  of lower limb, BP107
  of oral and pharyngeal regions, 84
  of pancreas, 296
  of pelvis
    female, 382
    male, BP98, 385
  of perineum, male, 387
  of posterior cranial fossa, 155
  of rectum, 381
  of scalp, 10
  of small intestine, 297
  of spinal cord, 178
  of spleen, 296
  of stomach, 296
  of testis, 383
  of thoracic wall, 198
  of uterus, 386
  of vertebral column, 178
Vena cava
  groove for, 284
  inferior, BP87, BP84, 185, 200, 210, 213, 217–219, 221, 225, 229, 233–234, 236, 241, 267, 273–276, 278, 284, 288, 293, 296, 311–313, 323, 326–332
    lung groove for, 205
    opening of, 227
    valve of, 224
  superior, BP51, 87–88, 210, 215–221, 224, 228–229, 233–234, 241, 244, 246–248, 325
    lung groove for, 205
    superior, 198–199
Venae comitantes, 450
Venae rectae, 297
Venous arch
  dorsal, 5, 473
  posterior, superficial, 513
  superficial palmar, 450
Venous communications, body of C3, BP42
Venous plexus, BP98, 64, 350, 357, 369. *See also* Pampiniform (venous) plexus
  around vertebral artery, 179
  basilar, 114–115
  cavernous, of urethra, BP90
  external, 374, 381
  in foramen magnum, 19
  internal, 374
  pampiniform, T6.2, 383
  pharyngeal, 76
  prostatic, BP98, 349, 385
  rectal
    external, 375–376
    internal, 375–376
    perimuscular, 381
  vaginal, 401
  vertebral artery with, BP42
  vertebral (of Batson), 114
    internal, 177
  vesical (retropubic), BP98, 349, 352, 385
Ventral plane, 1
Ventral root, BP38
Ventricles (cardiac), 228
  left, BP51, BP57, 216, 218–221, 223–225, 228, 244, 248
    branches to back to, 223
    posterior vein of, 222
  right, BP51, 216–221, 228, 244, 248
Ventricles (of brain), 119, 125
  fourth, 117, 125, 157
    choroid plexus of, 120, 125
    choroidal branch to, 154
    imaging of, 160
    lateral and median apertures of, 157
    outline of, 154
    rhomboid fossa of, 124
    taenia of, 125
    vein of lateral recess of, 155
  lateral, 117, 121, 123, 150, 157
    central part of, 117
    choroid plexus of, 117, 120–121, 150, 154, 156
    frontal (anterior) horn of, 117, 160
    imaging of, BP32
    lateral vein of, 157
    medial vein of, 157
    occipital (posterior) horn of, 117, 121–123, 154, 157, 160
    temporal (inferior) horn of, 117, 119, 122, 157
  third, 117, 121–122, 125, 157
    choroid plexus of, 117, 119–120
    imaging of, BP32, 160
    infundibular recess of, 50
    tela choroidea of, 119, 122, 156
Ventricular folds, 91
Ventricular veins
  hippocampal, 157
  inferior, 157
Vermian artery, inferior, 154
Vermian vein
  inferior, 155
  superior, 155, 157
Vermiform appendix, BP86, 272, 280–281, 283
  orifice of, 281
Vermillion border, 8
Vermis, 50, 126
  imaging of, BP32
  inferior
    nodule of, 126
    pyramid of, 126
    tuber of, 126
    uvula of, 126
  superior
    central lobule of, 126
    culmen of, 126
Vermis *(Continued)*
    declive of, 126
    folium of, 126
Vertebrae, BP4
  lamina of, 244
  pedicle of, 244
  radiology of, 165
Vertebral artery, BP23, 19–20, 29, 39–40, 76, 82, 88–89, 141, 149–152, 176, 179, 184, 230, 240, 418
  anterior and posterior meningeal branches of, 112
  cervical part of, 147
  in foramen magnum, 19
  imaging of, 31–32
  left, 147, 154, 179
  meningeal branches of, 20
    anterior, 147, 154
    posterior, 147, 154
  right, BP42, 147, 179
  venous plexus and, BP42, 179
Vertebral body, BP38, 177
  articular facet for, 193
    inferior, 193
    superior, 193
    transverse, 193
  branch to, 177
  of C2, 34–35
  cervical, BP18, 27–28
  of L2, 185
  of L3, BP37
  lumbar, 164
  posterior intercostal artery branch to, 177
  posterior surface of, BP33
  of S1, 165
  of T12, 165
  thoracic, 176
    fourth, 234
Vertebral canal, 163–164
Vertebral cavity, BP3
Vertebral column, BP4, 162
  veins of, 178–179
Vertebral foramen, T3.1
  cervical, 26–27
  lumbar, 164
  thoracic, 163
Vertebral ganglion, 141, 230–231, 243
Vertebral ligaments, BP33
  lumbar region, 168
  lumbosacral region, 167
Vertebral notch
  inferior, BP36, 163–164
  superior, 164
Vertebral plexus, 20, 141
Vertebral region, 3
Vertebral veins, BP42, 241
  accessory, 179
  anterior, 179
  left, 179
  right, 179
Vertebral venous plexus, T3.1
  anterior, BP42
  external, 178
    anterior, 179
  internal, 178
    anterior, 179
Vesical arteries
  inferior, BP98, 266, 316, 350, 380, 382–385
    posterior branches of, 385
  internal, 347
  superior, BP98, 256, 317, 347, 380, 382, 384–385
Vesical fascia, BP88, 346–347, 349, 352, 359, 373, 378
Vesical fold, transverse, 344, 348, 356–357

- **Vesical nodes**
  - lateral, 319
  - prevesical, 319
- **Vesical plexus**, 305, 320, 392, 394, 396, 398–399
- **Vesical (retropubic) venous plexus**, BP98, 267, 385
- **Vesical veins**
  - inferior, 381
    - posterior branches of, 385
  - superior, 267, 381
- **Vesical vessels, inferior**, 390
- **Vesicocervical fascial fibers**, 347
- **Vesicocervical space**, 347
- **Vesicosacral (sacrogenital) fold**, 348
- **Vesicouterine (uterovesical) pouch**, 345–346, 350, 356–357, 373
- **Vesicovaginal space**, 347
- **Vesicular appendix**, 355, 371
- **Vessels**
  - blood, innervation of, 214, 232
  - fibers direct to, 232
  - of neck, 39–40
- **Vestibular aqueduct**
  - internal opening of, 108
  - opening of, 15, 20, 110
- **Vestibular area**, 125
- **Vestibular fold**, 92
- **Vestibular fossa**, 358
- **Vestibular ganglion (of Scarpa)**, 108, 135
- **Vestibular gland, greater**, 360–361, 371, 386
  - opening of, 358
  - primordium, 371
- **Vestibular nerve**, BP28, 105, 108, 110, 135
  - inferior part of, 108, 110, 135
  - superior part of, 108, 110, 135
- **Vestibular nucleus**, 127–128
  - inferior, 135
  - lateral, 135
  - medial, 135
  - superior, 135
- **Vestibular (oval) window**, 21, 108
- **Vestibular (Reissner's) membrane**, 109
- **Vestibule**, BP28, 92, 105
  - bulb of, BP90, 352, 359–361, 386
    - artery of, 353, 361, 386
  - of ear, 108–109
  - of vagina, 353, 358, 371
- **Vestibulocochlear nerve (CN VIII)**, BP28, 20, 60, 76, 105, 108, 110, 124, 127–128, 142
  - distribution of, 129
  - imaging of, BP32
  - schema of, 135
- **Vestibulospinal tract**, BP43
- **Vincula longa**, 454
- **Vinculum breve**, 454
- **Visceral arteries**, BP41
- **Visceral fascia**. *See* Pretracheal (visceral) fascia
- **Visceral lymph nodes**, 268
- **Visceral peritoneum**, 279, 378. *See also* Serosa (visceral peritoneum)
- **Visceral pleura**, BP49
- **Vitreous body**, 100
- **Vitreous chamber**, 103
- **Vocal fold**, BP44, 77, 91–92
- **Vocal ligament**, 90–91
- **Vocalis muscle**, T2.9, 91–92
  - action of, 93
- **Vomer**, 11, 15, 17, 45, 49
- **Vomeronasal organ**, 43
- **Vorticose vein**, 99, 103–104
  - anterior tributaries of, 104
  - bulb of, 104
  - posterior tributaries of, 104
- **Vulva**, 358

W

- **White blood cells**, BP15
- **White commissure, anterior**, BP43
- **White matter**, BP43
  - imaging of, BP32, 160
  - of spinal nerves, 174
- **White rami communicantes**, BP41, BP39, 141, 143–145, 172, 174, 186, 197, 213, 231–232, 234–235, 243, 269, 300, 303, 306, 321, 392, 394, 397–399, 488
- **Wirsung, pancreatic duct of**, 279
- **Wolffian duct**, 368, 371. *See also* Mesonephric (wolffian) duct
- **Wormian bone**, 13, 16. *See also* Sutural (wormian) bone
- **Wrisberg, intermediate nerve of**, 107, 134, 142, 146
- **Wrist**
  - arteries of, 452, 459
  - bones of, 446
  - cutaneous innervation of, 462
  - deeper palmar dissections of, 450
  - extensor tendons at, 460
  - extensors of, 431
  - flexor tendons at, 452
  - flexors of, 432
  - ligaments of, BP102, 444–445
  - movements of, 443
  - nerves of, 452, 459
  - radiographs of, 447
  - superficial dorsal dissection of, 458
- **Wrist** *(Continued)*
  - superficial palmar dissections of, 449
  - superficial radial dissection of, 457

X

- **Xiphoid process**, 193, 196, 202, 204, 249–250, 252, 328
  - pubic, T5.1
  - of sternum, 187, 194

Y

- **Y ligament of Bigelow**. *See* Iliofemoral ligament
- **Yoke**, 18

Z

- **Zigzag line**, 239, 277
- **Zona orbicularis**, 477
- **Zona pellucida**, BP95
- **Zone of sparse muscle fibers**, 238
- **Zonular fibers**, 100–103
  - equatorial, 102
  - postequatorial, 102
  - preequatorial, 102
- **Zygapophysial joint**, BP34, 29, 248
  - capsule of, 29–30, 168
- **Zygomatic arch**, BP17, 12–13, 22–23, 55
- **Zygomatic bone**, BP17, 8, 11–13, 17, 50, 94
  - frontal process, 11
  - of newborn, 21
  - orbital surface of, 11
  - temporal process of, 11, 13
  - zygomaticofacial foramen of, 11, 13, 21
- **Zygomatic nerve**, 61, 63, 98, 132–133
  - zygomaticofacial branch of, 82
  - zygomaticotemporal branch of, 82
- **Zygomatic process**, 21
  - of maxillary bone, 11, 17
  - of temporal bone, 13, 17
- **Zygomaticofacial artery**, 10, 99
- **Zygomaticofacial foramen**, 11, 13, 21
- **Zygomaticofacial nerve**, 9, 61, 63, 98
- **Zygomaticofacial vein**, 10
- **Zygomaticofrontal suture**, BP17, 12
- **Zygomaticoorbital artery**, 10, 99
- **Zygomaticotemporal artery**, 10
- **Zygomaticotemporal nerve**, 9, 61, 63, 98
- **Zygomaticotemporal vein**, 10
- **Zygomaticus major muscle**, T2.9, 20–21, 31, 55, 134
- **Zygomaticus minor muscle**, T2.9, 20–21, 31, 55, 134